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Monopoly Prices — **Ludwig von Mises**

The Impossibility of Socialist Economy — **Morgan O. Reynolds**

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Book Review

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MONOPOLY PRICES[1]

LUDWIG VON MISES

THE CHARACTERISTIC FEATURES OF MONOPOLY PRICES

Terminological Remarks

It is customary to distinguish between competition and monopoly. This distinction suggests the idea that in the case of monopoly there is no competition at all. However, this is not true with regard to the monopolies we have to deal with in a study devoted to the problems of a market economy.

In a perfect socialist system, the state would enjoy the absolute all-round monopoly. The state, as the only owner of all means of production, would be in a position to face every individual with the alternative of either yielding to all the wishes of those in power, or starving. In the same position would be an enterprise owning all of the supply of potable water and all the supply of one of the factors of production required for rendering other water potable.

The monopolies we have to deal with are not absolute monopolies, but relative monopolies. Ultimately, all these commodities compete with one another. Every market commodity has its substitutes. No such commodity is necessary and indispensable in the strict sense of these terms. Competition is a factor in the determination of monopoly prices also.

It is only under this reservation that we are allowed to use the terms competitive price and monopoly price, competitive market and monopolized market.

Furthermore, it is important to realize that we have to deal with monopoly prices, not with monopolies as such. The mere existence of monopoly is irrelevant. Under copyright law, every author or publisher of a book has a monopoly. However, this fact alone does not give the author or publisher any advantage if other conditions do not supervene. It may even happen that they will not find any buyer for their book, no matter how low may be the price they are asking for it.

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[1]Editors' note: Mises marked this previously unpublished paper "Revised, July 1944" (Grove City College Archive [IV S2, F7, D/22–24]). It is his most in-depth treatment of the issue of monopoly prices, providing even greater detail than the later discussion in *Human Action* (New Haven, Conn.: Yale University Press, 1949, pp. 354–76). The editors would like to thank Grove City College for providing access to Mises's papers and Bettina Bien Greaves for permission to publish this paper. The editors have made minor changes in punctuation, usage, and presentation for purposes of clarity.

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The Nature of Monopoly Prices

The Greek word monopoly means that there is only one seller of a certain commodity on the market. The usual definition of monopoly is: Control of the supply of a certain commodity on the part of one seller or of a group of sellers operating in concert.

However, not every seller enjoying a monopoly finds it advantageous to deviate from the potential competitive price. If a rise of the price above the potential competitive price results in a more-than-proportional restriction of the quantity bought by the public, the total proceeds of the seller would drop. He would hurt his own selfish interests by deviating from the competitive price. If at the competitive price of 5 per unit 100 units can be sold, the total proceeds are 500. If a rise in the price to 6 per unit reduces the quantity sold to 80, the total proceeds drop to 480; no "monopoly price" in the technical meaning of this term is more advantageous to the seller than the competitive price. But if at the price of 6 per unit it is possible to sell 90 units, the substitution of the monopoly price of 6 for the competitive price of 5 increases the total proceeds of the seller from 500 to 540.

Under free competition, there prevails a tendency to adjust the quantities of various commodities to be produced and the allocation of the factors of production to the various branches of industry to the wishes of the consumers. What prevents a further expansion of the production of copper or of shoes is the fact that such an expansion would not pay. It would be unprofitable because the prices which could be obtained for the products would not cover the costs of the factors of production required. While the consumers in buying a greater quantity of copper or of shoes are not prepared to recompense the seller for the prices of the required non-specific factors of production, they are ready to make up for the same factors of production, in buying some other commodities. The profit motive pushes the enterprisers toward the production of those commodities for which the demand of the consumers is most urgent. Under the profit motive, the consumers, on a competitive market, decide how much raw material and labor should be used for the production of copper or shoes and how much for the production of some other merchandise.

But it is different under a monopoly price. If some special barriers prevent other people from competing with the monopolistic sellers, a restriction of the production of copper or of shoes that does not comply with the demands of the consumers becomes possible. Although the consumers are ready to pay for additional quantities of copper or shoes at prices which would render an expansion of production profitable on a competitive market, the sellers, sheltered by monopoly, do not expand production if they are better off under a state of affairs which results in a higher income for them with curtailment of production.

Control of supply means that no outsider is in a position to counteract the monopolist's deliberate restriction of supply by offering on the market an increased quantity of the commodity concerned.

There is no need to enter into sophisticated hair-splitting with regard to the question of what should be regarded as the "same" commodity and how the various commodities should be distinguished from one another. It would be useless to discuss whether all silk neckties are to be considered as specimens of the commodity

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class "silk neckties" or whether we have to consider every pattern as forming a commodity class of its own. The practical problem that matters is the reaction of the consumer to a rise in the price. If any rise in the price of one special pattern above the competitive price results in such a restriction of demand that the total proceeds drop, such a rise would hurt the interests of the seller. Whether or not we consider his commodity as unique, and his position as a monopolistic one, is immaterial for the market, for the consumers, and for the allocation of factors of production.

The Plurality of Monopoly Prices

On a competitive market there prevails a tendency to make differences in the prices of a commodity disappear. In the long run every unit is bought and sold at the same price. At this price total demand and total supply are momentarily equal. The temporary coexistence of a plurality of prices for the same commodity is the outcome of the fact that the forces making for change are still operating and that a state of equilibrium has not yet been attained.

In the case of monopoly prices the monopolist has generally the choice between different monopoly prices.

Let us consider this example.

Price per unit of the commodity	Amount of units that can be sold at this price	Total proceeds of the sellers
11	40	440
10	52.5	525
9	56	504
8	60	480
7	75	525
6	80	480
5*	100	500

*competitve price

Here we have three possible monopoly prices: 7, 9, and 10. The prices of 7 and 10 are more favorable for the monopolist than the price of 9. He will choose between the prices of either 7 or 10. But if the amount that can be sold at the price of 10 is only 50 and the total proceeds consequently only 500, there is only one monopoly price most favorable to him, namely 7.

In sketching a scheme like the one above, the economist is omniscient. He pretends to know beforehand what the reaction of the public to any price changes will be. In reality, monopolists lack such omniscience. They must discover by speculative anticipation and by trial and error whether there is any monopoly price possible at all, and sometimes, if so, which of the various possible monopoly prices is the most advantageous for them.

It is this uncertainty about future reactions of the public that makes it often practically difficult to draw a sharp line between monopoly prices and competitive prices. The line is, however, sharp indeed. But the only means for a monopolist to find out whether a policy of restraint will be more favorable to him than selling at the

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competitive price is to try it. We see therefore many abortive attempts to embark upon a monopolistic price policy which the reaction of the public frustrates.

The Imperfect Monopoly

Let us consider this example:

Price per unit of the commodity	Amount of units that can be sold at this price	Total proceeds of the sellers
8	50	400
7	70	490
6	90	540
5*	100	500

*competitve price

If one man, A, owns 80 units, and other people 20 units, *A* is in a position to embark upon a monopolistic price policy, no matter what the behavior of the outsiders is. He sells 70 units at a price of 6 and gets 420, instead of 400 which he would have received in selling 80, his total supply, at a price of 5. It does not matter for him what the outsiders do. They may continue to sell at a price of 5 or raise the price to 6.

But if *A* owns only 55 units and the outsiders 45 units, it is impossible for *A* to adopt a monopolistic policy. If he sells 45 units at a price of 6 (instead of 55 at a price of 5) he makes 270 only (instead of 275). In this case, a monopolistic policy requires a cooperation of *A* with a sufficiently large group of outsiders.

Duopoly and Oligopoly

The assumptions on which the discussion of the problems of duopoly and oligopoly is built are these: there are two or more sellers on the market. The public's reaction to a restriction of supply would enable the sellers to engage in a monopolistic policy of restraint and price raising. They are all eager to engage in such a policy. But for some mysterious reasons—pride, mutual distrust, or simply spleen —they are not prepared to combine and to adopt a uniform policy. There is no agreement, either open or tacit, between them. Each of them acts on his own. But as the conditions for the establishment of an imperfect monopoly are absent, each is forced in his pursuit of a policy of monopoly prices to take into account the policies of his rivals. Each seller must consider each move in view of the possible counter-moves of his rivals.

The aim of all sellers concerned is the substitution of a monopoly price for the competitive price. Duopoly and oligopoly are therefore not special classes of monopoly prices. They are special classes of the policies adopted on the part of the sellers for the establishment of a monopoly price.

The monopoly price established as a result of duopolistic and oligopolistic rivalries may differ from that which would have been established by a combine between them. Each rival's share in the monopolistic gain may differ from what it would have been under a concerted action. But the outcome is necessarily always either the establishment of a monopoly price or the failure of the attempts to establish any monopoly price.

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Some economists devoted great intellectual effort to the study of duopoly and oligopoly. However, we may wonder whether these problems are of any practical importance. It is probable that the sellers concerned will always come at least to a tacit agreement.

The Monopolized Commodity

The commodity the price of which can be made a monopoly price can be:

(1) a consumers' good,

(2) a material factor of production,

(3) a special kind of skilled labor,

(4) a license required for a special kind of production or marketing,

(5) a technological recipe which is secret or the utilization of which is only free to especially privileged persons or firms (e.g., patents, copyrights),

(6) a name or a trade-mark the use of which is reserved to certain people.

Under competitive conditions, the specific factors of production are in the long run used to the extent permitted by the opportunities of alternative uses for the non-specific complementary factors. The poorest soil tilled and the poorest mine exploited do not yield any rent. A further expansion of production in such a way as to exploit poorer soil and poorer mines would not cover the costs of operation.

Under monopoly, a greater part of the specific factors of production concerned will remain unused. The common feature of all instances of monopoly prices is that part of the supply, which under competitive conditions would have been offered on the market, is withheld from the market. The most spectacular and objectionable instance of this withholding is the purposeful destruction of the commodities concerned. It happened mostly with consumers' goods (e.g., coffee) but sometimes also with factors of production.

As a rule, however, the monopolists do not destroy the commodity concerned. Their restraint of trade consists in producing a smaller amount and consequently in not using a greater part of the resources than would have remained unused under competitive conditions.

It is necessary to realize that this restriction of the production of a certain commodity makes an amount of capital and labor available for other lines of production. We will later deal with the consequences of this outcome.

Profit and Monopoly Gain

Profit is a surplus of the price realized in selling a commodity over its cost, i.e., over the amount of money which the seller had to spend for acquiring or manufacturing it.

The price of every commodity is the result of an interplay of supply and demand. If—other things being equal—the quantity offered for sale were greater, the price would be lower. It is therefore permissible to say that profit is an outcome of the relative insufficiency of the supply, i.e., the insufficiency when compared with the supply of other commodities. But this is tantamount to the establishment of the fact that there is no equilibrium in the distribution of the various factors of production

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between the various branches of industry. It is, of course, a truism to assert that a state of perfect equilibrium can never be attained in a continuously changing world. In such a world, there can never be stability and equilibrium, although there prevails permanently a tendency toward the establishment of both. However, every change of data disturbs anew the processes tending toward stability and equilibrium. In a progressing society, there can never be stability.

Under special conditions, it is possible for an entrepreneur to add a monopoly gain to his profit. If one entrepreneur or a group of entrepreneurs owns a supply large enough for the establishment of at least an imperfect monopoly, and if the competition of firms newly entering this special field of production is not to be feared for the moment because some time is needed for the production, the establishment of a temporary monopoly price is feasible, by withholding a part of the supply available from the market.

Again and again, people have confused the two things, profit and monopoly gain. It is true that the fact that the supply available at any moment is not larger than it really is, is the outcome of the conduct of entrepreneurs. But no individual entrepreneur is in a position to prevent anybody else from counteracting his restraint by an expansion of production.

The mere fact that an entrepreneur did not produce more of the commodity in question is not indicative of a monopolistic restraint, even if his plant has a capacity for a larger output. The reasons for his not producing more can be twofold: either he lacked the funds for a larger production, or he believed that employment of the rest of his available funds in other lines of business would be more advantageous, i.e., would satisfy more urgent needs of the customers.

The question is always: Can an individual gain by restricting production? If someone else is free to increase output, an individual can increase his profits only by increasing output, not by restricting it.

The main fault of many current doctrines dealing with monopoly and competition is that they shut their eyes to the fundamental fact of economic activity. They do not realize that the factors of production are scarce and that one branch of industry cannot expand other than by withdrawing scarce factors from other branches.

The Role of Increasing or Decreasing Costs

A monopoly price is always a price of a consumers' good or of a factor of production needed—either on account of physical and natural conditions, or on account of institutional and legal conditions—for the production or the marketing of a commodity. If a production aggregate or a whole branch of industry enjoys a monopolistic position, it always owes it to the fact that it has a monopoly with regard to one of the factors of production needed. The specific monopoly gain must always be imputed to the fact that the monopolist owns such a commodity or privilege.

Average cost of production, i.e., cost of production per unit produced, changes as a rule with the amount produced. It may either increase or decrease with the restriction of output. It is easy to understand how this fact influences the monopolist's attitude.

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Increasing costs:

Price per unit	Amount of units that can be sold at this price	Cost per unit sold	Total costs	Total proceeds	Total surplus of proceeds over costs
8	40	3.4	136	320	184
7	60	3.6	216	420	204
6	80	3.8	304	480	176
5	100	4.0	400	500	100

The monopoly price most favorable to the monopolist is 7.

Decreasing costs:

Price per unit	Amount of units that can be sold at this price	Cost per unit sold	Total costs	Total proceeds	Total surplus of proceeds over costs
8	40	5.0	200	320	120
7	70	4.8	336	490	154
6	85	4.5	382.5	510	127.5
5	100	4.2	420	500	80

The monopoly price most favorable to the monopolist is 7.

The Role of Difference in Production Costs

Even if entrance into an industry is free to anybody, a monopoly could develop if the differences in production costs are large enough.

Let us consider the case of local monopolies of bulky goods, e.g., building materials or coal. A firm which owns all of the stores of clay needed for the production of bricks in the neighborhood of a city can obtain monopoly prices (1) if and as far as there is no competition of other building materials, and (2) if the freight rates for the shipping of bricks from more distant places are such that a monopoly price can be found within the margin of the competitive local price and the price which would allow competition of those tile-works situated in other places.

Price per unit of the commodity	Amount of units that can be sold at this price	Total proceeds of the sellers
7	70	490
6	90	540
5*	100	500

*competitve price

If the transportation costs are more than one per unit, a local monopoly price of 6 can be established. But if the transportation costs are less than one per unit, a local monopoly would be out of the question.

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The same is true with regard to national monopoly prices. The establishment of a national monopoly (mostly through cartelization) is possible if the costs of importation from abroad plus import duties are high enough. A national monopoly is unfeasible if foreign producers are in a position to underbid on the domestic market any possible monopoly price.

Moreover, analogous conditions make it possible to attain monopoly prices for an industry the future prospects of which are at the time deemed unfavorable.

There may exist one plant for the production of the commodity A. Using its full capacity it could turn out 100 units. But 100 units could only be sold at a price of 5; this price would not cover the cost of operation, it would involve a loss and still less would it leave any room for a return of the capital invested in the buildings and the machinery. Conditions being such, there is no need to be afraid of a newcomer's entrance into the industry. The existing plant can restrict its output and sell the quantity produced at a price that not only covers the cost of current production, but may also allow a return of the capital invested in the plant. In some cases, it may happen that the entrepreneur nets above this return a net monopoly gain. If, notwithstanding this fact, no outsiders enter this field of industry, the reason is that they consider the further prospects as unfavorable. They believe that too much capital has been invested in this branch, and that market conditions make investment in other branches more advisable.

It is necessary to realize that this particular case of monopoly prices is unlikely to play an important role within a progressing society. In such a society, there prevails a tendency toward both progressive accumulation of capital and technical improvements. If a newly established plant is in a position to produce at lower costs or to turn out a better product, the advantage of the older plant disappears.

Price Discrimination

In any case in which monopoly prices are advantageous for the monopolist, it would be still more advantageous for him to discriminate among the buyers and to charge every customer the full value of the service. (Moreover, price discrimination can also be favorable to the seller in cases in which any monopoly price would involve a loss.)

There are two facts with regard to price discrimination: (1) it does not result in any restriction of the amount sold; and (2) it brings about a drop in the price of a part of the units sold, and thus makes the commodity or the service in question accessible to customers in reach of whom it would not be in the case of the competitive price.

A doctor is in a position to sell forty units of service in the week. If he were to ask $6 per unit, he could sell ten units; at $2, forty units; at $1, fifty units. The competitive price is $2. At that price people who cannot afford to pay more than $1 must forego his services.

But if out of the forty units twenty are bought by people who would be ready to buy ten units at a price of $6 per unit, price discrimination would mean: ten units are bought at $6 per unit, and twenty units at $2; there remain ten units which can be bought by people who cannot afford to pay more than $1. The doctor makes $90

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(instead of $80). The wealthiest of his patients pay more and are forced to restrict their consumption. A class of less-wealthy customers is in a position to be served.

It is important to realize that price discrimination is applicable not only on the part of sellers who are in a monopolistic position, i.e., sheltered against the entrance of outsiders into their field, but also in the field of competitive business. A hotel, for instance, may charge lower rates than those generally charged, to special classes of patrons, e.g., ministers, members of special clubs, or special groups of business. The above mentioned doctor, too, will not be in a monopolistic position.

The Regulation of Competition

The history of economic progress is a record of the substitution of cheaper and better methods of production and of marketing for more expensive methods resulting in less satisfactory achievements. It is a record of free competition.

It is a fact that competition is not always fair. Ruthless people often resort to lies, slander, and calumnies in order to bring competitors and their products into bad repute. They take recourse to blackmail and to sabotage. They procure for this purpose the services of gangsters and libelists. It is one of the tasks of the penal code and the courts to wipe out these pests.

It happens time and again that such criminal methods are applied with the deliberate intention of establishing a monopoly for whose establishment the necessary institutional and economic conditions would otherwise be lacking. There is, however, no need for special anti-monopoly laws to suppress the resort to procedures which are in themselves defined by the penal code as criminal offenses without any regard to the purpose they serve in the individual case.

Meddling with the conditions of competition is an authoritarian policy aiming at counteracting the democracy of the market, the vote of the consumers. If a government interferes for the protection of the railroads against the competition of motor-buses, it curtails the freedom of the individual to use his income in a way that he himself considers the most appropriate. It forces people to subsidize the railroads and to get less for the money spent.

What is euphemistically called government regulation of competition is necessarily always a restriction of the freedom of the consumers to choose the commodity or the service they would choose in the absence of such regulation. The government hinders some enterprises or groups of enterprises from competing as efficiently as they could. Some countries of continental Europe have developed these methods to great perfection, protecting the arts and crafts against the mechanical factory, the small shopkeeper against the big stores and chain stores, the local dealer against the mail order houses, and so on. But such methods are not totally unknown to America, either.

Restriction of competition does not always result in monopoly prices. But its effects are nevertheless detrimental both for the buying public and for the potential competitors excluded.

Are Wage-rates, under Labor-Union Pressure and Compulsion, Monopoly Prices?

All that is valid with regard to monopoly prices of commodities is no less valid for wage-rates, provided the conditions required for the establishment of monopoly prices are present.

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If access to a special segment of the labor market is not free, and the demand for this kind of labor is such as to make monopoly wage rates advantageous from the viewpoint of the workers, a monopoly wage rate can be established.

Let us assume that a union has 500 members and that no outsider is allowed to work in the field concerned. At a wage rate of $5, all 500 members can find jobs. At a wage rate of $8, only 400 members can get jobs, while 100 remain unemployed. At the rate of $5, the total payroll would amount to $2,500; at the rate of $8, it would be $3,200. If the union charges all 400 employed members a fee of $1.60, it collects $640, and is in a position to grant to every unemployed member $6.40. Every union member, whether employed or unemployed, makes $6.40.

But if, on the other hand, at a rate of 8 dollars only 300 members could find jobs while 200 remain unemployed, the total payroll would drop from $2,500 to $2,400. The establishment of a monopoly wage of $8 would harm the interests of the union membership.

However, as a rule, labor unions espouse another policy. They do not bother at all about the well-being of those who cannot find jobs on account of the height of the minimum wage rate fixed by their policy. They do not indemnify those who suffer a loss. Thus, every restriction of access to their section of the labor market and every rise in wage rates is an advantage for those who still get jobs at the higher rate enforced by labor-union pressure and compulsion.

In the early stages of unionism, only comparatively small groups of skilled labor were unionized. At that time, the effect of unionism was not mass unemployment prolonged year after year, but an increase of the supply of labor in the non-unionized branches of industry. The counterpart of the rise in wage rates for union members was an increased pressure on the market of non-unionized labor. With the progress of unionization mass unemployment became inevitable.

Thus, labor-union policies, although restrictive, as a rule do not result in wage rates which are technically to be called monopoly rates. But the establishment of this fact does not mean that they are not open to objections on other grounds. Everything which was said above about government regulation that does not result in monopoly prices applies to unions too, as far as they hinder the entrance of people into a special segment of the labor market.

Furthermore, such restrictive union policies sometimes result in the establishment of monopoly prices in a field of business in which competition would otherwise prevail. It may suffice to quote a few lines from a publication which nobody would reproach with "union-baiting." Says T.N.E.C. Monograph No. 21: "The Chicago Master Cleaners and Dyers Association controlled the trade from 1910 to 1930; its power derived largely from the economic strength of four friendly unions—the Laundry and Dye House Drivers and Chauffeurs Union, Local 712 of the International Brotherhood of Teamsters, known as the truck drivers' union; the Cleaners, Dyers, and Pressers Union, Federal Local No. 17742 of the A.F. of L., known as the inside workers' union; and the Retail Cleaners and Dyers Union, Federal Local No. 17792 of the A.F. of L., known as the tailors' union" (p. 296).

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THE SOCIAL CONSEQUENCES OF MONOPOLY PRICES

The Mythology of Perfect Competition

The advocates of socialism criticize the system of free enterprise from various positions, and contradict themselves in their criticism.

On the one hand, they scorn the "madness" of the competitive system and complain about "cut-throat" competition. But at the same time the same people contend that in fact competition under capitalism is never "free" and "perfect" and that there are monopolistic elements in all so-called competitive prices.

The same contradictions appear in economic policies. On the one hand, governments are fighting monopolistic restraints of trade by various measures, the best known of which are the anti-trust laws. But at the same time, the same governments are eager to restrict the output of various branches of production or to withhold goods already produced from the market in order to raise prices. Moreover, they are intent upon contracting international agreements for the establishment of world monopolies.

It is an old practice of the foes of civil liberties to attack the concept of freedom from a metaphysical viewpoint. It was long the cherished method of the German advocates of despotism to cavil at the "negativism," "illusiveness," and "emptiness" of the notions of liberty and freedom. It is on their syllogisms that the present-day critics of "free" competition base their statements.

However, the liberal economist's plea for free competition has nothing at all to do with any metaphysical notions, and does not refer to any philosophical explanation of liberty. The old liberals advocated the abolition of laws preventing a man from competing on the market with privileged groups. They wanted to do away with the privileges of guilds and inns, monopolistic companies, and so on. They wanted to give everybody the right to choose his own way of life, his field of activity, and the methods of his work. This was what they had in mind in saying that competition should be "free."

The economists' plea for freedom of competition was exclusively motivated by their concern about the best possible satisfaction of human needs. (Applying a nowadays fashionable slogan, we would have to say: by their concern to attain freedom from want.) A law preventing a man from competing can never improve or increase or cheapen the supply of commodities. What it can achieve is always only protection of less efficient producers against the competition of more efficient ones. The efficient man can do without privileges.

The economists attacked the privileges granted to a less efficient producer in order to protect him against the competition of a more efficient rival. Such privileges, they pointed out, may be beneficial to the privileged. But their gain is the consumers' loss. The opportunities of the consumers to satisfy their needs as well and as cheaply as the state of technological knowledge and of the supply of material resources and of manpower allows are curtailed. If such privileges are granted only to one producer or to small groups of producers, they injure the interests of the great majority to the sole benefit of a minority. But if everybody were to be protected in this way, all are harmed. What a man may profit in his capacity as producer (whether entrepreneur, farmer, or wage-earner) is on the other hand absorbed by the loss he suffers in his

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capacity as consumer. Moreover, all are damaged by the fact that the privileges prevent the most efficient utilization of the factors of production available.

The economists' concept of competition does not refer to anything that could be called "perfection." Only people who never grasped the meaning of modern value and price theory can fall prey to such a crude misunderstanding.

It is fundamental for any treatment of competition that competition exists not only among the sellers of the "same" commodity, but among the sellers of many different articles competing with one another for the buyers' money. A firm supplants its rivals not only by selling the "same" commodity at a lower price, but no less by selling "better" commodities of any kind, i.e., commodities which the buyers prefer to those offered by other firms. It is futile to introduce into economic reasoning the concept of a "perfect" competition which assumes that the only means of competition is underselling the "same" commodity.

There is certainly full and real competition on the "market" for actors and singers. However, every high class performer is an individual. He does not compete on account of what he has in common with his competitors, but precisely on account of what distinguishes him from them. And he competes not only with other performers, but no less with a variety of other services and commodities. His success consists not only in attracting people who would have otherwise attended the performance of other actors or singers, but also in attracting people who would have otherwise spent their dollars for drinks, for a new hat, for a book, or for anything else.

Two specimens of the "same" commodity offered for sale may differ with regard to the place at which they are available. A grocer in a distant suburb can charge higher prices for the "same" article if the buyers find the extra cost not too high a price for the advantage of getting it in their neighborhood. In buying, a customer not only looks at the chemical and physical properties of the article, but also at many other things. He may prefer to buy in a cleaner shop or in a store in which service is quicker or more "smiling" than in other shops.

Only in the purchase of commodities the sameness of which can be established in an unquestionable way is underselling the only method of outstripping a competitor offering the same commodity. However, competition is on the wholesale markets of such staple commodities (for instance, metals, chemical compounds, fibers) not more "perfect" than on the retail markets of food, clothes, or shoes.

What counts is always whether a seller is or is not in a position to increase his total net proceeds by restricting the quantity of units sold. This question is not answered in the affirmative by pointing out that every seller could increase his sales by lowering the price asked. If we were to call every price which excludes some potential buyers from buying a monopoly price, all prices would have to be called monopoly prices. An unskilled worker asking 10 cents for a day's work would be a monopolist because the demand for his work would further increase if he were to ask 9 cents only. The distinction between monopoly prices and competitive prices would disappear altogether.

Yet, the distinction between monopoly prices and competitive prices as developed above makes good sense. It is indispensable for a theory of prices because it

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would be otherwise impossible to explain the value imputed to patents and copyrights, the essential features of cartel policy, and many other phenomena.

The conduct of every seller can be called a "policy." A job seeker refusing a job offered with a monthly pay of $200 and looking for one more remunerative adheres to a definite policy. So does every other seller reluctant to throw goods away. It is therefore a mistake to see in a "price policy" the indication of a monopolistic position.

Neither is price discrimination necessarily the outcome of monopoly.

It is a fundamental mistake to assume that in every case in which an enterprise does not expand its production and its sales to the limit in which increment costs would exceed the sales price, the latter is monopoly price. This would be true only for the state of equilibrium. But we must emphasize again and again that the state of equilibrium is a hypothetical concept only, although a concept indispensable for every economic analysis. In order to conceive the meaning of economic change, we are under the necessity of constructing the image of a society in which no changes at all occur. But we must never forget that such a state of static equilibrium is purely hypothetical and can never find any counterpart in reality.

In this imaginary state of perfect equilibrium, everything is stable. No changes at all occur. All relevant economic data remain permanently the same. In this stationary world, the total sum that a manufacturer must spend for the purchase of the factors of production required (including the adequate reward for his own labor, i.e., the reward corresponding to the state of the labor market) and for interest of the capital employed would be equal to the price he gets for the product. Nothing would be left for profit. Of course, such a world would not have any need for entrepreneurs and no economic function for profits. As only those things are produced every day which were produced yesterday, the day before yesterday, the last year, and ten years ago, and as the same routine will go on forever, as no changes in the supply or demand either of consumers' or of producers' goods or in technical methods happen, as all prices, wages, and interest rates are stable, there is no room left for any entrepreneurial activity.

The economists who constructed and used this imaginary scheme were fully aware of its fictitiousness and its unreality. They did not fail to recognize that in such a hypothetical world, man would no longer be human, but a soulless vegetative being. He would not be in a position to make use of his most human faculty, reason; he would live like an ant in its hill. The economists were not so foolish as to hold up this hypothetical state of perfect equilibrium as a pattern for a better social order or to criticize existing conditions from the viewpoint of their deviation from this pattern.

The actual world is a world of perpetual change. Population figures, tastes, and wants, the supply of factors of production, technological knowledge, and many other things are in a ceaseless flux. In such a state of affairs, there is a need for a continual adjustment of production to the change in conditions. This is where the entrepreneur and profits come in.

Those eager to make profits are always looking for an opportunity. As soon as they discover that the relation of the prices of the factors of production to the anticipated prices of the products seems to offer such an opportunity, they step in. If

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their appraisal of all the elements involved was correct, they make a profit. But immediately the tendency toward a disappearance of such profits begins to take effect. The booming branch of business, i.e., the branch in which profits are high, attracts other entrepreneurs. The booming branch tends to expand until competition makes profits disappear. Profits are a permanent phenomenon only because there are always changes in market conditions and in methods of production. The state of equilibrium can never be attained because nothing else is permanent in human condition but change. He who wants always to make profits must be always on the watch for new opportunities.

While profits do not turn up in the image of a static state, monopoly prices and monopoly gains are compatible with this image. An everlasting patent right fits very well with the other hypothetical assumptions of the static state and the equilibrium preserved in it. Neither is the existence of unused capacity of plants an element preventing the establishment of a static equilibrium. Of course, we must assume that the unused plants are only fit for the production of commodities for which there does not exist any demand and that their use as scrap material is out of the question. Otherwise, the equilibrium could only be reached when the unused plants or machinery have been completely absorbed either for the replacement of other plants and equipment used up or for a use as scrap material.

Thus, it becomes evident that profits and monopoly gains are two entirely different sources of revenue. The two must not be confused.

The fact that an enterprise does not use the full capacity of its equipment, although it would reduce average cost of production per unit by doing so, is, as has been pointed out above, not necessarily an outcome of a monopolistic policy. It does not render competition "imperfect." As long as there is a more profitable employment available for the capital required for the expansion of production, it is reasonable for the entrepreneur to abstain from such a further expansion. It is at the same time reasonable from the viewpoint of the consumer.

Let us assume that the constant costs of production of a plant with a capacity to produce 200 units is $100, and the variable cost per unit is $2. The plant uses only 50 percent of its capacity and produces 100 units at a total cost of $300, and consequently at an average cost per unit of $3. Production at full capacity would require a total cost of $500 and would reduce the average cost per unit to $2.50. If the additional capital required for this full capacity production can yield a higher return when used for another kind of production, it would be wasteful—both from the viewpoint of the entrepreneur and from that of the consumer as a totality—to use the plant's full capacity. This would withdraw capital and labor from other lines of production for the products of which the demand is more intense.

This reasoning applies, of course, only to the cases in which there is only one plant in the field concerned, or in which all plants operate with the same structure of the cost schedule. If there are several plants with different costs, those with the highest cost would have to go out of business, and the remaining, but for that with the marginal costs, could go on producing at full capacity.

Monopolistic restraint of trade always requires that the monopolist has the assurance that no competitor could frustrate his own restriction by an expansion of

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his sales. With every case of monopoly prices, we must be in a position to answer the question: what prevents other people from counteracting the monopolist's restriction? The answer may be the law (e.g., in the case of a patent or an intergovernmental agreement), an agreement (e.g., in the case of a cartel), their geographical remoteness (e.g., in the case of bulky goods), their exclusive ownership of one of the factors of production required (e.g., in the case of natural resources), a sufficient difference in the height of production costs (e.g., in the case above on p. 4), or the time required for the finishing of the process of production (e.g., the case described above on page 5). This is what people have in mind when defining monopoly as a state in which one seller or a group of sellers acting as a unit have the power "to control" supply. This term "control" becomes inadequate for the description of monopoly if we were to interpret it in another way.

The issue becomes still more manifest if we consider the fact that most enterprises do not produce one commodity only, but a variety of different articles. A textile plant, for instance, does not turn out one or a few patterns, but a multitude of various patterns. From the viewpoint of the "perfect" competition fallacy, competition would be "perfect" only if the entrepreneur were to expand the manufacture of each pattern up to the point in which the increment cost of production equals the marginal price that would be obtained on the market. Only then should he embark upon the production of a second pattern.

In reality, the entrepreneur finds it more profitable to stop producing a certain pattern before this point is reached and embarks upon the production of a second, a third, and many other patterns. He acts in this way because he wants to maximize his profits. But it is precisely the attitudes of the consumers that make the production of various patterns more profitable than restriction to the production of one or a few patterns only. In not pushing the production of a certain pattern to the point at which profits would disappear, the manufacturer adjusts production to the wishes and wants of the consumers. It is the consumer who orders him not to use the "full capacity" of one design up to the limit at which the profit must disappear.

The same is true for every branch of industry. It would reduce production costs for every plant if it were to restrict the variety of products turned out. A tool factory would reduce its costs of production if it were to produce only one standard type of hammer. It is the buying public that forces it to produce various types and sizes of hammer and many other tools besides.

Standardization of products can go as far as the public is ready to buy the cheaper article rather than a more expensive article of another pattern. It was the buying public that forced the Ford plant to substitute cars with various paints for the uniform black painted standard type.

The doctrine of imperfect competition is fabulous not only on account of its misconstruction of the concept of static equilibrium. It is also mistaken in its assumption that the structure of the schedule of physical costs alone directs production or should direct it in a perfect world. From the viewpoint of this fallacy, it would be impossible to explain why there exists a variety of manufacturing plants turning out different products from the same raw materials.

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The doctrine of "imperfect" competition was a desperate attempt of fanatical foes of free enterprise to refute the economists' demonstration that in a competitive market, i.e., in a market where there are no monopoly prices, a surplus of sales proceeds over production costs is always the result of the entrepreneur's success in providing the consumers with those commodities for which their demand is most intense. The champions of the doctrine of "imperfect" competition were deluded by their fanaticism and their zeal to disparage free enterprise. Their pro-socialist bias made them blind to the fundamental facts of economic activity and the characteristic features of any production under the division of labor.

The ideas that motivated their critique were these: modern economics had demonstrated that, under an unhampered market economy, the consumers, by their buying and their abstention from buying, direct the activities of the entrepreneurs. The market is a democracy of the consumers; the entrepreneur, eager to make as much profit as possible, is a mandatary of the consumers intent upon the most efficient satisfaction of their wants. Thus, one of the main slogans of the socialists, the famous demand for a substitution of "production for use for the production for profit" is exploded.

The socialists first attempted to refute this unassailable demonstration by pointing out that there is, in the evolution of unhampered capitalism, an inherent tendency toward the emergence of all-round monopoly. This trend toward monopoly was depicted as inexorable. It puts in the place of the democracy of the consumers, characteristic of the early stage of capitalism, long since passed forever, the arbitrariness of monopoly capitalism. Whatever may be said in favor of capitalism at its earlier stages does not apply to the conditions of monopoly capitalism. Monopoly capitalism is a system of ruthless exploitation of the masses for the sole benefit of big business.

But very soon the economists unmasked the fallacies of this doctrine. They proved that national monopolies are only possible in a world in which economic nationalism insulates the national economies from the world market through trade barriers, and in which patent rights are granted. International cartels are either the outcome of agreements of national cartels or the achievement of government interference. The trend toward monopoly is not inherent in the "natural" evolution of capitalism, but is the effect of institutions purposely aiming at the elimination of competition.

Now the socialists took recourse to a new ruse. There has never been, they asserted, such a thing as "perfect" competition. Practically every businessman is in a position to control output and therefore to restrict supply in a monopolistic way. Profits are always the fruit of monopolistic restraint of trade. Such is the doctrine of "imperfect" competition as developed by Mrs. Joan Robinson of Cambridge University. Mrs. Robinson is probably in her subconscious fully aware of the fallacies of her arguments. Otherwise she would not advocate the German and Russian methods for the suppression of all criticism. No independent universities, learned societies, and publishing houses should be allowed to exist. One can agree with the lady that her doctrine could not survive except under these conditions.[1]

[1]Mrs. Robinson wants, moreover, in the same way to prevent the existence of independent churches, theaters, and philharmonic societies.

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The Individual Consumer under Monopoly Prices

Under competitive prices, the consumers are supreme in directing the use of the available resources. The entrepreneurs, the capitalists, and the farmers must aim at supplying the market with the commodities most urgently asked for by the consumers. They must try to turn out, as cheaply and as well as possible, those quantities of every commodity for which the consumers are ready to pay at least the cost of production. There prevails a tendency to bring the price of every commodity down to the point where the price is equal to the cost of production.

The substitution of monopoly prices for competitive prices results in a deviation of production from the lines entirely determined by the attitudes of the buying public. Along with the consumers, the monopolists too have a voice in the direction of production and consumption.

The reaction of the individual consumer to a monopoly price may be different:

1. In spite of the price rise, the individual does not restrict his consumption of the commodity concerned; he is therefore under the necessity to restrict his purchases of other commodities which he deems less indispensable. (If all individuals were to behave thus, the competitive price would have already risen to the height of the monopoly price.)

2. The consumer restricts his purchase of the monopolized commodity to such an extent that he does not spend for it more than he would have spent—for the purchase of a larger quantity—under the competitive price. (If all people were to act in this way, the seller would not get more under the monopoly price than he did under the competitive price; he would not derive any advantage from deviating from the competitive price.)

3. The consumer restricts his purchase of the monopolized commodity to such an extent that he spends less for it than he would have spent under the competitive price; he buys with the money thus saved goods which he would not have bought otherwise. (If all people were to act in this way, the seller would harm his interests by substituting a monopoly price for the competitive price. Only a benefactor who wants to wean his fellow-citizens from bad habits would in this case raise the price of the commodity concerned above the competitive level.)

4. The consumer spends more for the monopolized commodity than he would have spent under the competitive price and acquires only a smaller quantity of it.

However the individual reacts, his satisfaction appears to be impaired from the viewpoint of his own valuations. He is, from the viewpoint of his own valuations, under monopoly prices not so well served as under competitive prices.

Free Enterprise and Monopoly

Monopolistic restraint of trade restricts the individual's opportunity to enter those fields of economic activity in which he could succeed best and render the most useful services to his fellow-citizens. It thus curtails the chances of the rising generation. It prevents a businessman operating in other branches of business from adjusting his outfit in the best possible way to existing market conditions by expanding it into a monopolized field.

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The idea of excluding competitors by the aid of government interference is very popular nowadays. It permeates the policies of influential labor unions. It is at the bottom of all plans to organize industry in compulsory bodies, whether they are labeled "self-government in industry" or corporativism, and whether they are promoted by governments calling themselves progressive or fascist. The purpose of all such endeavors is to return to the privileged inns and guilds and to the chartered companies which in the centuries preceding the evolution of modern industry hindered economic improvement and technological progress.

A characteristic outcome of this anti-competition spirit was the endeavors of various local interests to erect, by means of state legislation and measures of local administration, a substitute for inter-state trade barriers. It is one of the most beneficial provisions of the Constitution that it bars the way to all such "reforms." One needs only compare American conditions with those of Europe in order to appreciate what this absence of inter-state barriers means. The United States is the world's largest uniform market. Its people enjoy the advantages of big-scale production because there is free mobility of capital, men, commodities, and services within the whole country.

Free enterprise is the antithesis of all plans to protect by privilege a less efficient business against a more efficient. The only method of outstripping a competitor of which it approves is to produce and to sell better and cheaper products.

If American business wants to compete on foreign markets, it is under the necessity of adjusting its operations to the laws and usages of the countries concerned and to the economic conditions of these countries. It is therefore contrary to purpose to restrict the bargaining power of American export trade by imposing upon it restrictions to which its foreign competitors are not subject at all or not to the same extent.

The Economies of a Monopolistic Conduct of Affairs

By and large we must realize that the socialists are more sympathetic to monopoly than to competition. They disparage the competitive system unswervingly and aim at the establishment of an all-round government monopoly. The tears they weep over the vanishing of competition are crocodile tears. The only fault they find in monopoly is that it is private monopoly and not government monopoly.

One of the faults the socialists find with the competitive system is that in exploiting the natural deposits of ores, minerals, and oil, it does not care for the needs of future generations. Sooner or later, these deposits will be exhausted, and the coming generations will lack the most precious resources.

It is very difficult to enter into an examination of these arguments. We do not know what kind of natural resources men will need in the future. We are using today resources considered as useless and not utilized by our ancestors. Nobody, a hundred years ago, could have anticipated the role which oil and electricity are playing in our present economic system. Aluminum, today one of the basic metals, was sixty years ago merely a material for toys and other trifles. Every day brings us unheard of technological progress. If we were to restrict the utilization of some resources in order to leave them to later generations, we would not know whether we would not simply rob ourselves without rendering any service to them.

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But however that may be, a man who thinks that we should be more economical in the exploitation of mines and oil fields cannot blame the monopolistic policies of the respective cartels. If he is consistent, he must, on the contrary, consider the restriction of output in the extractive industries as a beneficial measure.

Apart from the case of the extractive industries, the socialists blame the competitive system for its wastefulness. It is wasteful because the rivalry between competing firms necessitates advertising and other useless selling costs and prevents the full utilization of the advantages of big-scale production.

However, it is not true that a monopolistic combine can always save the costs of advertising. Some monopolies can do without advertising. The U.S. Post Office does not need to attract customers by advertising. As correspondence is a general habit among our contemporaries, the customers pour in even in the absence of any expensive propaganda. But it is different with other monopolized branches of production. Although selling at monopoly prices, they are not safeguarded against losing their patrons to other branches of industry.

The proof that the monopolistic position as such does not free an entrepreneur from the necessity of advertising is given by the fact that books under copyright, patented articles, and brands under trademark protection do advertise.

Nor is it more true that the monopolization of an industry brings about technical economies in offering better opportunities for the utilization of the technical advantages of large-scale production. Insofar as production on a bigger scale is more economical than that on a smaller scale, it is precisely this difference in production costs that under competition eliminates the plants that did not succeed in adopting the most efficient methods of production.

The survival of smaller plants and their ability to stand the competition of larger plants is due to the fact that there is always a point beyond which increases in the scale of output are not attended by further gains in efficiency, and may sometimes even be attended by increased costs per unit of output. As far as large-scale production in manufacturing is technically superior to small-scale production, smaller plants are doomed to disappear. It is a mistake to believe that monopolization either through cartelization or through a merger is necessary in order to secure to the public the advantages derived from big scale production.

On the contrary, it is a fact that the monopolization of an industry sometimes aims deliberately at an artificial preservation of plants and farms that would not be in a position to stand the competition of plants and farms operating at lower costs.

The most conspicuous example is provided by government interference with the conditions of agricultural production. Changes in demand and supply and the emergence of new competitors operating under more favorable physical conditions force again and again the farmers and planters producing with the highest costs to discontinue production. This would have been the case in the last fifteen years with Latin-American coffee plantations, with American cotton and wheat growing, and with rubber plantations. The protectionist policies of the importing countries, the development of new synthetic products (e.g., rayon), and the general over-expansion of production in the boom period and the establishment of new competition on more

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fertile soil would have forced the submarginal producers to go out of business. Only those producers would have remained with whom the costs of production were lower than the market price of the product. However, the farmers and planters affected did not accept this solution. They succeeded in convincing their governments that the establishment of a monopoly would solve the problem in a more satisfactory way. While the results of competition would have been the elimination of those producing with highest costs, the governments made all producers submit to a proportional restriction of output. The establishment of the monopoly price was a means to preserve production artificially at costs which would have rendered production unprofitable under the competitive price. Production on lower-cost farms and plantations was restricted in order to make production at higher costs profitable. And, of course, the public had to foot the bill.

Similar conditions sometimes turn up in the processing industries.

Up to the eighteenth century, every handicraftsman whose routine was threatened by the competition of a more efficient rival had a claim to protection on the part of the authorities. Technological innovations, improvements in the methods of production, were deemed unfair. The preservation of the traditional business practices was considered one of the tasks of good government. The abolition of this anti-progressive policy, an achievement of the laissez-faire doctrines of British and French eighteenth-century economic philosophy, paved—late indeed—the way to the stupendous technological evolution of modern capitalism.

The colonists who founded the British settlements on the Atlantic Coast of America left behind them in the old country many bad usages and institutions. It never occurred to them to transplant the guilds and inns and their restrictive methods into their new communities. They did not believe in the expediency of a policy of putting obstacles in the way of the efficient and industrious and in fostering inefficiency, indolence, and backwardness. They did not assign to the authorities the task of perpetuating old-fashioned methods of doing things. Thus, they made America foremost in the field of technology. Today all non-Americans spontaneously associate the word "America" with the ideas of high efficiency and continual progress in industrial technique.

The victory of the laissez-faire idea in continental Europe was only temporary. Very soon the inveterate illusion that a country's well-being can be promoted by the preservation of plants unable to stand on their own the competition of more efficient plants triumphed again. One of the reasons why many governments of continental Europe encouraged the formation of cartels, and, if encouragement did not result in cartelization, directly forced the firms and corporations to combine, was precisely that they were anxious to secure the survival of the inefficient plants which would have been doomed on a competitive market. Under the monopoly price, brought about by cartelization, the inefficient plant can continue production. Cartelization was considered as a means to protect the producer against the superior efficiency of other plants.

American public opinion is entirely mistaken in believing that American big business has some reasons to sympathize with the European evolution toward cartelization, and that agreements concluded between American producers and

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foreign cartels are proof of an identity of interests. It is a fact that the European cartels are mostly weapons of economic nationalism built with the deliberate intention of fighting American economic expansion.

In the chemical industries, Germany—thanks to the natural resources of her soil and to the achievements of her scientists—is equal or even superior to all foreign enterprises. But in almost all other branches of production, natural conditions are less favorable than in other countries. As Germany can neither feed nor clothe its population properly out of domestic resources, it must export manufactures in order to pay for the badly needed imports of foodstuffs and raw materials. The German governments—for more than sixty years—have aimed at the encouragement of export trade by cartelization. The cartels sell on the domestic market at monopoly prices. They sell abroad at lower prices. The prices they charge to foreign buyers in many cases do not cover the costs of production. But the losses thus incurred are financed out of the monopoly gains on the domestic market. The native consumers subsidize, as it were, the dumping on the foreign markets.

If Germany had not adopted such a policy, American business groups would not have considered it as expedient to enter with German cartels into agreements concerning the partition of foreign markets. Such agreements became advantageous for America only in the face of German dumping as a means of parrying the blows of German economic nationalism.

The illusiveness of the belief that cartelization furthers technological improvement and the concentration of production in the places offering the most propitious opportunities can easily be proved by referring to Germany, the country most advanced in matters of cartelization. It is, for instance, one of the main objectives of the German steel combine to make the use of low-grade iron ore deposits profitable.

The operation of the market mechanism on a competitive market tends to eliminate technological backwardness, as the main tool of competition is either underselling or offering a better commodity for the same price. It is a mistake to believe that the incentive for technical improvement is stronger with a monopolistic organization than with enterprises competing on a free market. Moreover, it is a fact that monopolistic organizations were fostered by the governments with the manifest intention of preserving plants and farms producing at costs which would have prevented their survival on a competitive market.

IS THERE, IN THE "NATURAL" EVOLUTION OF FREE ENTERPRISE, A TENDENCY TOWARD A PROGRESSIVE SUBSTITUTION OF MONOPOLY PRICES FOR COMPETITIVE PRICES?

The Socialist Dogma

The socialist dogma, widely accepted today by people who would be indignant if somebody were to call them socialists, contends that the trend toward monopoly is inevitable in the "natural" evolution of capitalism. Our age is called the "age of monopoly capitalism," and all evils—economic depression, unemployment, and war—are charged to the sinister machinations of "monopoly capital." All governments

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emphatically declare that the foremost duty of good government is to protect the people against exploitation and depredation on the part of monopolies. Government all-round control of business, i.e., socialism, is advocated as the most efficacious means to free the world from the curse of monopoly.

If we want to inquire whether or how far this dogma is justified, we have first of all to emphasize that what people have in mind in indicting monopoly is not monopoly as such, but the substitution of monopoly prices for competitive prices. We do not have to enter into over-sophisticated hairsplitting concerning the "monopolistic" position of a man selling a commodity different from those offered by other sellers. What counts alone is whether or not a seller is in a position to increase his net revenue by restricting the quantity sold. The problem of monopoly is essentially a problem of monopoly prices, i.e., of monopolistic restraint of trade. Everybody understands it in this way. The question, therefore, is not: is there a "natural" tendency toward the emergence of monopoly? But: is there a "natural" tendency toward a progressive substitution of monopoly prices for competitive prices?

There is no doubt that the last decades have witnessed a progressing tendency toward the replacement of competitive prices by monopoly prices. But it is an undisputed fact that the vast extension of the sphere of monopoly prices was the result of government policies deliberately aiming at the establishment of monopolistic restraint of trade. The governments have either directly forced business to monopolistic pricing methods or have provided the conditions required for such policies, confident that the enterprises concerned would profit from the opportunity offered.

The mere fact that governments have acted in this way is the clearest evidence that with regard to the branches of production affected by this government policy such a "natural" tendency toward monopolistic restraint does *not* prevail. If such a tendency were to exist, it would be quite superfluous to adopt measures of this kind. The fact that a law makes it possible for an inventor to apply for a patent and thus to acquire a monopolistic privilege does not indicate that an inventor is—in the absence of patent legislation—in a position to embark upon a monopoly price policy with regard to his invention. On the contrary, it is the proof of the fact that but for the government's interference, such a policy would be out of the question.

The problem we have to deal with is: is it true or not that there prevails in the "natural" evolution of modern business, i.e., in the evolution not hampered by government interference deliberately aiming at the establishment of monopolistic restraint, a tendency toward the progressive substitution of monopoly prices for competitive prices? It is obvious that this question is answered in the negative for all those fields of business activity in which there is government interference aiming either at compulsory establishment of monopoly prices or at the establishment of the institutional conditions required for the building of monopolistic price policies.

It is not the aim of our investigation to question the expediency of those governmental policies deliberately encouraging the emergence of monopoly prices. This is a separate problem. What we have in mind is to unmask the utterly mendacious and dishonest attitude of those demagogues who describe the trend toward monopoly prices as the outcome of an evolution inherent in the conditions of an economy of

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free enterprise. It is, furthermore, necessary to expose the double-dealing of governments which proclaim anti-monopoly policies as their foremost aim and at the same time eagerly work for the establishment of monopoly prices in many lines of business.

Government-Made Monopolies

The main source of monopolization is the deliberate creation of monopolies on the part of governments. There are two classes of such monopolies: those which are established with the manifest intention of substituting unlimited monopoly prices for competitive prices, and those which aim at the restriction of competition without the intention of bringing about unlimited monopoly prices. Let us first consider the second class.

Monopolies with Limited Price Rises

In many countries, the governments have restricted access to some branches of production and distribution in order to secure to special groups a higher revenue than what they could earn on a free market and under competitive prices.

This policy must not be confused with the laws requiring the fulfillment of special conditions on the part of those eager to exercise a certain profession or business activity. In this country, for instance, the exercise of the medical profession is free only to men and women who have passed certain examinations. However, everybody who has passed these examinations is free to practice medicine. Neither the authorities nor the already practicing doctors have the right to prevent a newcomer who has complied with all requirements from entering the field. The aim of the laws concerned is not to shelter the old doctors against the competition of newcomers, and to restrict competition, but to protect the public against quacks.

It is different with the laws which in many European countries restrict access to the business of pharmacists, chimney-sweepers, taxi-cab enterprises, and so on. These laws order the authorities to grant new licenses only if the interests of the already practicing licensees are not too much prejudiced. It is the manifest and undisguised intention of the laws to secure a certain minimum income to the licensees.

On the other hand, these laws are not intended to give to the licensees the power to charge ad libitum monopoly prices. They, therefore, order the authorities to fix price ceilings for the commodities sold and the services rendered. These price ceilings, as a rule, fix the maximum prices at rates above the height which would have been established on a free market. They are monopoly prices. But the seller is prevented from choosing that monopoly price which would bring him the highest monopoly gain.

Monopolies with Unlimited Monopoly Prices

Patents: The laws of all civilized nations grant patents to new inventions. It is the intention of these laws to encourage the inventive spirit by creating temporary monopolies.

The question whether the patent system really contributes to progress in technological methods is controversial. It is true that most of the attacks directed against

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patent protection have come from people biased by fanatical anti-capitalism. But there are also other critics of the system whose arguments cannot be easily disregarded.

However, the experience of the last hundred years proves that the patent system has at least not obstructed the utilization of new inventions. It has encouraged the inventive spirit by providing ingenious men with the incentive to spend the best years of their lives in the task of inventing, and has given business the incentive to spend huge sums for research. Public opinion does not find any fault with an institution which makes it possible for an inventor to get a reward for the benefits which his fellow-citizens derive from his contribution to mankind's progress. It would consider the abolition of the patent laws as a grave injustice.

Copyright: Hardly anyone attacks the copyright laws. Thanks to the monopolistic position that these laws secure to authors, it is possible for successful writers of fiction, and likewise of non-fiction, books and articles destined for the general reader to make a living from their writing. The author no longer depends on the munificence of some Maecenas as in older days. He depends on the buying public.

Trademarks: The way in which many authors have discussed the question of whether trademarks are monopolistic clearly exposes the shallowness of substituting the alternative *monopoly or competition* for the alternative *monopoly price or competitive price*.

There cannot be any doubt about the monopolistic nature of a trademark. Under the law, the use of a certain name, sign, or mark to distinguish one's own products is a monopoly right. But this fact alone does not mean anything at all for the formation of the prices of the article marked with this name. A name in itself is an arbitrary combination of letters. An indefinite number of other such combinations can be made and registered as trademarks. Each person is free to choose as many trademarks as he wants.

The commercial meaning of trademarks is that they enable a businessman to build up goodwill. By virtue of a trademark or brand name, the producer can enter into direct business relations with the buying public. The buyer knows whose product he is buying, and is in a position to distinguish in his purchase between products he likes more and those he likes less. He can profit from the experience which he had in the past in trying various products. He becomes a permanent patron of those manufacturers whose products did satisfy him. He can recommend the product he likes to friends who have not yet found out what brand suits them best. Thus, a manufacturer—by serving the public well—is in a position to acquire a prestige in the same way in which every shopkeeper, hotel owner, or doctor acquires it. Trademarks thus play an important role in the conduct of present-day business. If no legal protection were accorded to the use of trademarks, the buying public would lack any orientation.

It is one of the functions of trademarks to enable the customer to distinguish the various brands with regard to their chemical and technological qualities and to choose that which best complies with his wants and tastes. But this is not the only function of trademarks.

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What the use of a trademark gives to the manufacturer is the opportunity to deserve goodwill. Goodwill is the renown a man or a firm acquires on account of past achievements. It implies the expectation that the bearer of the goodwill, in the future, will live up to his past standards. Goodwill is not a phenomenon only in business relations. It is a feature present in all human and social relations. It determines a person's choice of his wife and his friends and his voting for a candidate in elections.

It can sometimes happen that the goodwill of a trademark gives to a manufacturer the opportunity to substitute monopoly prices for competitive prices. However, as a rule, the advantage derived from the use of a well-known trademark is not so great as to make a purposeful restriction of the quantity offered for sale profitable.

But even if a branded article is sold at monopoly prices, nobody suffers any detriment. If a dental cream marked as Cleopatra can be obtained only at monopoly prices, no manufacturer is prevented from selling the same cream under another name. Nobody can say that his interests are harmed by the monopolist's restriction of output.

The mere fact that two products, which are the same with regard to their chemical and physical properties, can be sold at different prices on account of the difference in the appraisal of the brand name on the part of the public is not in itself proof of a monopolistic restriction of output. It is only the effect of the goodwill.

The marketing of a commodity requires a certain degree of publicity. The potential buyers must know that such a commodity exists and who the potential sellers are. To be publicly known to some extent is thus an indispensable requirement of every commodity to be sold.

In the wholesale trade of staple commodities, the exchanges and similar institutions provide buyers and sellers with the opportunity to meet one another for the transaction of business. In the producers' goods industries, agents, commission-merchants, middle-men, and go-betweens bring both parties together. In the consumer-goods industries, publicity must be acquired through advertising, and, as the average man has a weak memory, advertising must be continued. An article which the buying public does not know or has forgotten will not be bought. Its manufacturer will either not get the opportunity to deserve goodwill or will lose it very soon.

The degree of publicity is an important element in the determination of the quantity that can be sold. The better known a brand is, the more easily can it be marketed, provided that it suits the tastes and wants of the consumers. But this is not tantamount to a monopolistic position of the seller enabling him to fare better by restricting sales instead of increasing them.

National Cartels: With the exception of some bulky goods in the marketing of which transportation costs play an important role, the establishment of national cartels is only possible if an import duty insulates the world market. A national combine would not be in a position to establish monopoly prices on the domestic market if foreign competitors were free to sell at a lower price.

Now, tariffs are not an outcome of the "natural" evolution of free enterprise. They are always the result of a deliberate policy. As far as cartels and monopoly prices are conditioned by the existence of tariffs, they are not the result of a spontaneous evolution, but of government interference with business.

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Prior to the intervention of various governments, both state and municipal, there were even in the field of public utilities competing gas and electric companies. Competitive development was the rule rather than the exception. It has been the policy of exclusive franchise that has locally prevented the competition of coterminous utilities.

It was the Federal Communications Commission that recommended the combination of Western Union and Postal Telegraph and the establishment of a similar monopoly in the field of international communications.

International Agreements of National Cartels: If there exist national cartels in a good many of the great industrial nations, the free world market shrinks to a comparatively unimportant part of the whole world market. The much greater part of the total consumption of the commodity concerned is sold and bought at monopoly prices. The consumption of the rest of the world—most of them backward countries with a low standard of living—is comparatively insignificant. Then it is not too difficult for the national cartels to come to an amicable arrangement concerning the open market. An international cartel becomes practicable.

Compulsory International Cartels: The most conspicuous instance of government-made cartels are those international treaties which the International Labor Office euphemistically calls "Inter-Governmental Commodity Control Agreements."

The preamble of the rubber agreement, signed in London, May 7, 1934, by Great Britain, France, India, the Netherlands, and Siam, reads as follows:

> Considering that it is necessary and advisable that steps should be taken to regulate the production and export of rubber in and from producing countries with the object of reducing existing world stocks to a normal figure and adjusting in an orderly manner supply and demand and maintaining a fair and equitable price level which will be reasonably remunerative to efficient producers, and being desirous of concluding an agreement for this purpose.

What an amazing circumlocution for the simple fact that the agreement aimed at a restriction of output in order to substitute a monopoly price for the competitive price.

Similar intergovernmental agreements were entered into with regard to many other commodities, e.g., sugar, tea, beef, coffee, timber, tin. International commodity agreements with varying degrees of governmental sanction or participation concern, moreover, aluminum, lead, nickel, zinc, mercury, nitrates, petroleum, potash, sulphur, quinine, and raw silk. It is worthwhile mentioning that Soviet Russia does not refuse to cooperate in such agreements with the "capitalist" nations.

Monopolization Without Direct or Indirect Government Support

It is probable that even in the absence of any government support, incentive, or compulsion, some monopolies could develop and substitute monopoly prices for competitive prices. This could happen under special conditions:

1. With regard to public utilities;
2. With regard to some bulky goods;

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3. With regard to those mineral resources which are concentrated in one place or in a small number of places.

The two first named cases could bring about local monopolies. The third case could result in a world monopoly.

The problem of public utility regulation is essentially a problem of administration. As the public utilities are under the necessity of coming to an agreement with the federal government, the states, or the municipalities, with regard to the use of publicly owned roads, streets, and water supply, there is ample opportunity for arrangements safeguarding the interests of the consumers.

Local monopolies of bricks and coal are unlikely to play an important role in this age of steel and cement, prefabricated houses, oil, and electricity.

The economist would be at a loss for an answer if somebody were to ask him for another instance of a world monopoly fostered without any aid, compulsion, or participation on the part of governments than that of the diamond monopoly.

It is not incorrect, although an overstatement, to call our age the age of monopoly. But that it is so is the outcome of government policies, not of a tendency inherent in the free enterprise system.

CONCLUSION

The substitution of a monopoly price for a competitive price is tantamount to a serious restriction of the working of the most characteristic principle of the free enterprise system, i.e., of the sovereignty of the consumers. It restricts output although such a restriction does not suit the wishes of the public. It secures to the monopolist an extra gain which is not derived from the best possible satisfaction of the needs of the consumers. With regard to these facts, we may say that monopoly prices are abnormal in the framework of a market society.

So far public opinion is right in criticizing monopoly prices. However, public opinion is entirely mistaken in assuming that there prevails in a market economy not hampered by government interference with business a natural tendency toward a progressive substitution of monopoly prices for competitive prices. There is no such tendency. Most instances of monopoly prices are either directly or indirectly government-made. But for the policies of various governments there would exist local monopolies, but only rare cases of national and still less of international monopolies.

If a government aims at establishing the conditions required for the appearance of a monopoly price, it is driven by the opinion that such a monopoly price is, under the given situation, the most appropriate solution of an economic problem. This opinion may be questioned. But it is nonsensical to attack the monopoly as such and not the policy which results in the creation of a monopoly.

The case is obvious with patent and copyright legislation. It is the clear intention of these laws to grant to inventors and authors the opportunity to get monopoly prices. Whether this is a good or bad policy is a question of its own. But it is contradictory to criticize the monopoly price and not the policy which made its appearance possible.

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The aim of a protectionist tariff is to improve the nation's balance of trade, and to maintain a high domestic standard of wage rates. The expediency of protection of import duties insulates the domestic market.

The attitude of the governments and of public opinion with regard to monopoly prices is utterly inconsistent. The governments are eager to build international cartels and provide the conditions required for the creation of national monopolies. Public opinion approves these policies. But on the other hand, the same governments and the same public opinion passionately indict the Moloch of monopoly.

This country has promulgated laws which are intended to prevent the formation of monopolies and trusts. The authorities are eager to enforce these laws. But on the other hand, the U.S. is a party in international agreements the ostensible purpose of which is monopolistic restraint of output and trade in essential raw materials and food stuffs. Moreover, the agricultural policies of the New Deal were unambiguously directed at the same goal.

The outstanding fact which we must keep in mind is: there is no tendency toward a general substitution of monopoly prices and monopolistic restraint of trade for competitive prices.

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THE IMPOSSIBILITY OF SOCIALIST ECONOMY, OR, A CAT CANNOT SWIM THE ATLANTIC OCEAN

MORGAN O. REYNOLDS

> To decide whether an undertaking is sound we must calculate carefully.
> – Ludwig von Mises, *Socialism*

The socialist calculation debate has been prolonged, contentious, and often confusing (Vaughn 1980; Yeager 1997). Few issues in economics are more important, yet our understanding remains muddled, judging by the work of prominent mainstream theorists (e.g., Stiglitz 1994; Roemer 1994), as well as the debate in the Austrian tradition over the dehomogenization of Mises and Hayek (Salerno 1993, 1995; Yeager 1997).

If a common opinion prevails within the economics profession today, it may be that socialism is unworkable in practice but cannot be rejected on logical grounds as inherently destructive and inefficient. Some economists may not have strayed very far from Schumpeter's faulty assessment (1954, p. 989) nearly a half century ago:

> so far as its pure logic is concerned the socialist plan makes sense and cannot be disposed of on the grounds that it would necessarily spell chaos, waste, or irrationality. . . . There exists a determined set of solutions of the equations that can be realized by the method of "trial and error."[1]

Contemporary economists and the general public are heavily influenced by the collapse of the Soviet Union and its former captive states in Eastern Europe, a deadly

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[1]Austrian economist Karen Vaughn, for example, concedes (1980, p. 544), "What [Mises and Hayek] argued was that the ability to calculate rationally under socialism was 'practically impossible' because the theory, while logically consistent, did not capture enough important features of the real world to make it applicable." A lapel button for sale in Red Square following the collapse of the Soviet Union was closer to the truth: "Socialism: 2x2 = 5." This illogical equation, done in jest, is not a bad way to capture the essence of Mises's impossibility theorem, albeit missing the critical details.

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historical experiment.[2] Yet the failure of self-proclaimed socialist states is not strictly relevant to the question of the ability of socialism to achieve given ends economically. Why? Because state planners, just as entrepreneurs, capitalists, and everybody else, had access to real money prices to calculate low cost means to achieve their given ends (Mises 1963, pp. 698–99; Rothbard 1991, pp. 73–74). Like the U.S. Postal Service and other state bureaucracies operating in world markets, Soviet planners could borrow market prices to calculate the cost of alternative processes. A true test of socialism's ability to economize would be far more demanding than that faced by twentieth-century socialist planners, since the system would have to find cheap ways to do things in a world without markets for capital goods.

Mises (1981) was the first economist to isolate the fatal flaw in socialism at the deepest level—socialist economy is impossible because no human director in such a system could possibly find ("calculate") the cheapest way to accomplish any given project among the infinite variety of ways to do the job. Without market prices to evaluate the opportunity costs of resource use in terms of final consumption goods, planners could not tell how best to produce outputs, nor consequently which outputs to produce. Mises's theorem is a deeper if narrower point than Hayek's subsequent elucidation of the "knowledge" problem. While Hayek performed a valuable service by pointing out that the immense amount of relevant data, dispersed among the population as it is, could not possibly be reliably assembled at the center, I believe that impartial observers will ultimately conclude that Hayek's contribution is not on an intellectual par with Mises's theorem. Hayek's observation is one of the many reasons (incentive failures, coordination failures, etc.) that socialism cannot possibly work as well as a capitalist economy.[3] Hayek's focus on the decentralized nature of human knowledge complements but does not replace or substitute for Mises's breakthrough.

Mises used the standard *ceteris paribus* approach of scientists to deduce his theorem. Mises was willing to suppose that all the production data known to every human being on earth could be assembled accurately at the center every day; even under this fantastic assumption, conceded to proponents of socialism for the sake of argument, he argued that the director still lacked a means to discover the cheapest way to accomplish his purposes; all he would have is statements "unrelated to each other. There is no means of establishing any connection between them" (1963, p. 698). Thus, there is no way to list the lost value in terms of goods ready for consumption for each method adopted.

The failure of economists to clearly grasp and appreciate Mises's proposition implies a serious defect in the profession's understanding of the work performed by the price system, as well as of the gross inferiority of the substitutes available to replace its functions upon disabling it, wholly or partially. Apparently Mises, despite his best efforts, did not bare the fundamental flaw in socialism clearly enough for the

[2]Hoppe (1989, p. 120) correctly argues, "Experience does not beat logic, but rather the opposite is true. Logic improves upon and corrects experience."

[3]For a stern assessment of Hayek's effort to add something of value to the socialism debate, see Hoppe (1996).

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profession to see it. The gravity of the situation is suggested by Paul Craig Roberts's assessment (1990, p. xxvi) that "If we do not learn the lessons, the twentieth century will have been lived in vain." The preeminent issue of our century has been capitalism versus socialism—the decentralized market economy versus centralized political direction of resources.

The purpose of this article is to restate and clarify what Mises meant and to defend Mises's conclusion against some of the challenges hurled against it. One article cannot refute all the fallacies surrounding the calculation or economizing issue, but it can recast the impossibility theorem and refute some of the key misunderstandings. I disclaim originality, but by resorting to first principles I hope I can contribute to our knowledge by amplifying and restating, much as Salerno (1993) and Rothbard (1991) have done, so that more economists understand why economy is impossible under concentrated or common "ownership" of the means of production.[4]

PRELIMINARIES ON ECONOMICS AND OWNERSHIP

So much confusion surrounds the socialist calculation debate that we had best start at the elementary level. Principles textbooks in economics claim that an economic system grinds out answers to three implicit questions: What?, How?, and For whom? Agreed. Which question, then, is the focus of the calculation debate? It is the "How" question, plain and simple. All else is secondary.

Economy of means, after all, is the principal occupation of economists. How does Mises handle the other two questions? In effect, he is willing to drastically simplify and put these questions aside by positing that only "one will acts." Despite socialism's grave problems with the What and For whom questions, then, they are answered by the planner's preferences, by assumption. Regarding the director's preferences, Mises correctly asserts, "As a rule, anyone in possession of his senses is able at once to evaluate goods which are ready for consumption" (1981, p. 98). Again, the only issue is how can socialism find the cheapest way for the planner who wants to build a house, build and equip a cannery, or liquidate undesirables. It must accomplish something at the smallest lost (subjective) value of production in goods ready for consumption elsewhere for each possible method.

We must also agree on a few institutional preliminaries. A prerequisite for the exchange of scarce goods and services is effective control (ownership or the right of disposal) over them by two or more potential trading partners. Such dispersed control over commodities (*de facto*, if not *de jure*) must exist for markets to operate. This necessary condition is true regardless of what legal arrangements might exist at a time and place.[5]

Modern property-right theorists recognize that the efficiency of an economy (populated by human beings as we know them) depends on the institutional rules or

[4]My treatment also overlaps that of Herbener (1996), a penetrating article with which I find no substantive quarrel.

[5]According to Posner (1992), an ideal property regime for social efficiency would legally protect exclusive, transferable (alienable), and universal rights in all economic goods, assuming costless operation of the legal regime.

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property rights structure. Ownership is intimately connected with rewards or incentives, and therefore with individual actions and both individual and collective prosperity. A laudable feature of the Communists has long been their recognition of the primordial importance of property (compared to the tone deafness of many economists); as Marx and Engels expressed it in their celebrated *Communist Manifesto:* "The theory of the Communists may be summed up in the single sentence: Abolition of private property" (Tucker 1978, p. 484).

MISES'S THEOREM: IF NO ENTREPRENEURS AND MARKET PRICES, THEN NO EFFICIENCY

The next order of business is to define socialism. Socialist writers and reformers have had many items on their agendas. To paraphrase Maurice Dobb, central planning means the abolition of markets or it means nothing. The most ambitious version has been called communism because it would effectively abolish money, private property and all trade in consumption (lower-order) goods, intermediate (higher-order) goods, and all factors of production, including labor. Markets would be replaced wholesale by central command. Many socialist writers have called this the "natural economy," meaning a non-monetary, in-kind system without exchange. Less ambitious forms of socialism presumably seek an incomplete ban on private property and trade for a subset of commodities, namely, the so-called means of production we define as capital goods, including land, in favor of "socialism" in such means of production. Presumably money, property, and trade would continue to be allowed in labor services and goods ready for consumption. The exact ownership of intermediate commodities and goods in process is left unclear in socialist writings, but presumably these are socialized.

To clarify the definition of socialism, Mises (1963, p. 695) wrote, "The essential mark of socialism is that *one will* acts. It is immaterial whose will it is. . . . The main thing is that the employment of factors is directed by one agency only." This is consistent with the pervasive theme in Marx, Engels, Bukharin, Lenin, Sweezy, and other "true" socialists. As Engels said, socialist men "with full consciousness, will fashion their own history" and manage everything very simply, like a single workshop or factory (Roberts 1990, p. 14). The idea of planning, of course, grew from the socialists' desire to abolish private property and the anarchy of the market system, and replace these with "science" applied to society.

On the eve of the Communist *coup* in Russia, Lenin wrote in August 1917, that

> to organize the whole national economy on the lines of the postal service . . . all under the control and leadership of the armed proletariat—this is our immediate aim. This is the state and this is the economic foundation that we need. (quoted in Roberts 1990, p. 28)

Surprisingly, Lenin wrote with some insight about the calculation failure of socialism before abandoning his effort to institute it in March 1921:

> The difference between socialization and simple confiscation is that confiscation can be carried out by "determination" alone, without the ability to calculate and distribute properly, *whereas socialization cannot be brought about without this ability.* (quoted in Roberts 1990, p. 31)

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> Let us frankly admit our complete inability to conduct affairs, to be organizers and administrators. . . . If we are to be absolutely definite, we must know exactly what we are going to do over the year ahead. Who knows that? No one. (quoted in Roberts 1990, p. 35)

To solidify our understanding of Mises's theorem, consider the following compact restatement. All of the following systems of socialism are identical in their key feature, namely, centralized control of the means of production: isolated socialism, universal socialism, isolated communism, universal communism, central planning, abolition of decentralized ownership and trade in the means of production, monopoly or concentrated control of inalienable means of production. Specifically, Mises's theorem is that socialism has the following properties and consequences:

1. No monetized trade in capital goods (no transferable rights).
2. No money prices for capital goods.
3. No money cost calculation of production methods employing capital goods.
4. No alternative method of calculating the opportunity costs of various means to a given end in a vast, technically advanced society is possible.
5. Only arbitrary (uneconomical, inefficient, socially irrational) allocation decisions remain possible.

Therefore, socialism is necessarily wasteful, cannot serve consumer wants, and must be "planned chaos." Q.E.D.

The essence of the theorem—economical action is impossible because the lowest-cost option cannot be figured out—rests on the insight that scarce capital goods go unpriced under isolated socialism. With apologies to economists who already fully understand Mises's theorem, Appendix A offers a numerical illustration. In socialism's quest to free workers from the domination of private capital in favor of "empowering" them through socializing capital, socialists (inadvertently) abolish the possibility of cost calculations and therefore the ability to economize. As Milton Friedman might observe, in their normative obsession with "equality," socialists overlook the paramount normative function served by the price system, namely, productive efficiency (Friedman 1976, pp. 197–98). Without the ability to calculate the cost of alternative production techniques, disaster looms. And Mises rightly and courageously insisted that no one has proposed a credible alternative to replace capital markets.

No one can deny steps 1, 2, and 3 of the theorem; in fact, these historically have been among the basic objectives of socialists. Rational socialists (those aware of the problem of economy in resource use) must attack step 4. They must show how a real human being can figure out the lowest cost means without the aid of real prices generated by private entrepreneurs bidding for the use of assets.[6]

[6]As an anonymous referee points out, my reference to "real prices" is problematic for neoclassical readers, who might object that productive and allocative efficiency requires prices to be perfectly competitive and externality-free rather than real. For them, neither real-world capitalism nor real-world socialism are Pareto efficient, so the question becomes whether the informational and bureaucratic costs associated with central planning are smaller than the likely benefits from correcting so-called market failures. For Mises, by contrast, rational calculation requires only actual

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The action in Mises's theorem centers on step 4 of the restatement. Mises explains that this crucial step rests on two real-world features, namely, complexity and change, with the major emphasis on complexity. In effect, Mises (1981, p. 98) concedes that socialism can work (economical choice) without market prices for capital inputs if the choice problem is primitive enough. Consider this key quotation:

> As a rule, anyone in possession of his senses is able at once to evaluate goods which are ready for consumption. Under very simple conditions, he should also have little difficulty in forming a judgment upon the relative significance to him of the factors of production. When, however, conditions are at all complicated, and the connection between things is harder to detect, we have to make more delicate computations if we are to evaluate such instruments. Isolated man can easily decide whether to extend his hunting or his cultivation. The processes of production he has to take into account are relatively short. The expenditure they demand and the product they afford can easily be perceived as a whole. But to choose whether we shall use a waterfall to produce electricity or extend coal mining and better utilize the energy contained in coal is quite another matter. Here the processes of production are so many and so long, the conditions necessary to the success of the undertaking so multitudinous, that we can never be content with vague ideas. To decide whether an undertaking is sound, we must calculate carefully.

At the risk of confusion, perhaps a mathematical metaphor can illuminate Mises's meaning: we can solve very simple mathematical problems in our head but we can only solve complicated mathematical problems with the aid of pencil and paper (writing tools). In the former case, we can mentally embrace the whole problem without calculation aids while in the latter case our grasp stumbles over the many steps to solution and we require aid. Similarly, the hunter-gatherer once figured out simple allocation problems without market prices for capital goods because the decision maker succeeds "in reducing all elements in the computation to such commodities as he can evaluate immediately, that is to say, to goods ready for consumption and the disutility of labor" (Mises 1981, p. 98). Such successful intuition is impossible with lengthy and roundabout processes of production.

> In the narrow circle of a closed household, where the father is able to supervise everything, he may be able to evaluate alterations in methods of production without having recourse to money reckoning. For, in such circumstances, production is carried on with relatively little capital. Few roundabout methods of production are employed. As a rule production is concerned with consumption goods, or goods of higher orders not too far removed from consumption goods. Division of labor is still in its earliest stages. . . . It is possible to survey the whole process of production from beginning to end. It is possible to judge whether one particular process gives more consumption goods than another. But, in the incomparably more complicated conditions of our own day, this is no longer possible. (Mises 1981, pp. 101–2)

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market prices, those arrived at by a rivalrous process of continual bidding by entrepreneurs for factors of production, and whatever expectations these decentralized planners may have about future prices. These prices, of course, generally are distinct from perfectly competitive prices, but "suffice for practical purposes" (Mises 1981, p. 105).

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So Mises's argument boils down to the fact that the length and complexity of production relations changes the whole character of the problem. Without reliable calculation of the opportunity cost of resource use in terms of goods ready for consumption, economical choices are impossible (economy is impossible). And the only way it can be achieved is with the "aid" of the action of all in a market system. Capitalism integrates all goods, not just those ready for consumption, into a vast exchange network using a general medium of exchange. Clearly, it works pretty well, although certainly not perfectly. "True, money calculations are incomplete," writes Mises.

> True, they have profound deficiencies. But we have nothing better to put in their place. And under sound monetary conditions they suffice for practical purposes. If we abandon them, economic calculation becomes absolutely impossible. (Mises 1981, p. 105)

OBJECTIONS

Mises's challenge to socialists is clear: Socialism can answer the "what" and "for whom" questions of economics based on one person's preferences (who couldn't?), but it has no means to figure out how to operate in a remotely efficient manner. Confronted with the director's desire to build a dam, it cannot calculate the list of lost production of consumption goods elsewhere in the system for each possible method of dam construction. Which method would least decrease valuable production elsewhere? None of the engineering reports and inventories of resources gives "him any clue to the solution of this problem" (Mises 1963, p. 698). The possibilities are endless, and the planner is clueless. Concrete assignments of inputs to production processes (and more or less continuous reassignments in accord with changing conditions) must be nothing but arbitrary. As Mises wrote: "It is just a system of groping about in the dark. There is no question of a rational choice of means for the best possible attainment of the ultimate ends sought. What is called conscious planning is precisely the elimination of conscious purposive action" (1963, pp. 700–1).

Socialists and mainstream economists ignored or scoffed at the Mises theorem in the 1930s and 1940s. Some economists, however, seriously tried to suggest ways around the devastating problem raised by Mises. None of the alternatives succeeded in showing how an ordinary acting mortal could calculate costs (economize) without real prices for capital goods. None of the (shadowy) alternatives proved remotely valid compared to the scarcity prices continuously generated and regenerated in the market system, though many fervently wished at least one would have proven cogent. Mises refuted many of the socialist rejoinders (1963, pp. 703–15), but apparently without persuasive success.

Fixed Factor Proportions

One reply to Mises is to define away or trivialize the economic problem of choice among the infinite number of lengthy and roundabout techniques. If there is only one method available to produce each consumption good, then there are no serious choices of input proportions to be made (in the glib terms of mathematics, location-less and individual-less right-angle production isoquants in two-input space, or more

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generally, fixed production coefficients). The socialist planner need only choose a combination of consumption goods based on his subjective valuations because of the simple structure of production. Economic calculation of lowest cost means is rendered unnecessary in such a primitive economy because the connections between consumption goods and production processes are unique by assumption.

Since the abandonment of Ricardian economics, few economists believe that the world is characterized by zero input choices (Sraffa, 1960, is the famous exception). Instead, most would probably agree with Mises that

> the present state of technological knowledge makes it possible to produce almost anything out of everything. . . .The only reason why the synthetic production of drinking water today . . . is out of the question is that economic calculation in terms of money shows that it is a more expensive procedure than other methods. (1963, p. 699)

Mises (1963, p. 712) correctly adds, "We must take into account real conditions."

Stationary Conditions

Another way to define away the problem of choice of the cheapest production process is to argue that society moves from private capital ownership to socialism without further change in economic data. Then activities can merely repeat themselves, relying on the previous economies discovered by capitalism. This scenario, of course, assumes that the ruler does not wish to alter the demand for goods ready for consumption, which generally would change the value of inputs and therefore the cheapest process. Mises's theorem still stands. The changeless society envisioned by socialists is impossible.[7]

The notion of stationarity has an inkling of empirical relevance for traditionally static societies, as well as the twentieth-century socialist states, where central planning is basically reduced to annual goals of 10 percent more of everything. Nonetheless, the changeless society is a pipedream, if only because of the renewal problem for depreciating (aging) capital goods.

Simulated Markets

This possibility departs drastically from the spirit and sentiment of most socialist speculation. Economists defending neosocialism imagine an isolated central authority that is denied real market prices for capital goods and services but who can rationally figure out least-cost processes by knowing scarcity "shadow" prices of capital goods. Socialism would only involve the elimination of real capital and financial markets. Private-ownership rights in capital disappear but the relative efficiency of capital allocation actually achieved does not suffer and may even improve.

In this imaginary world, newly selected or established non-entrepreneurs, non-capitalists, non-promoters, non-speculators, and non-business managers supposedly

[7]Mises (1981, chap. 10) divides the perpetual changes in all economic systems into six great sources: external nature, the quantity and quality of the population, the quantity and quality of capital goods, techniques of production, the organization of labor, and demand.

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continue their exertions as if the consequences of their actions were capitalized into their wealth, but know full well that the resulting profits and losses are delivered entirely to the agency of the commonweal.[8] Through the operation of these toy markets, neosocialism discovers non-arbitrary scarcity prices of capital services: the pretended buying and selling of pseudo-entrepreneurs and pseudo-capitalists operating with fictive coupons generates the necessary price information. Although no personal wealth consequences affect these ever-alert traders, they behave in the same way as if their own futures depend on the outcomes of these transactions.

The absurdity of this proposal is transparent. First, it must be deeply disappointing to real socialists since it concedes Mises's point: socialists cannot find least-cost production processes without capital markets. The scheme has nothing to do with socialism as originally conceived. As Polanyi (1951, p. 125) observes, "Modern Socialist theory, by adopting the principles of commerce, has quietly abandoned the cardinal claim of Socialism: the central direction of industrial production. . . . Oscar Lange (1938) makes no reference to planning in the proper sense." Second, such behavior is unfamiliar in human history. Imaginary creatures devote their energies to selfish capitalist simulations because of their selfless devotion to the neosocialist state. Ironically, the lack of entrepreneurs and capital prices under neosocialism is remedied by selfless pseudo-entrepreneurs and pseudo-capitalists recruited (evaluated and re-selected how?) to avoid the irrationality of socialism.[9]

The Mises theorem is reaffirmed again. Socialism cannot generate the necessary capital prices via simulations played out by people as we know them. How can socialists escape Mises's iron vise? They could argue that socialism would work in a world composed of a special breed of new "socialist men and women" who selflessly re-enact the despised profit-seeking exertions of entrepreneurs and capitalists, thereby generating reliable capital prices. This vision would seem to attract few revolutionaries. In any event, the Mises theorem applies to humans with all our limitations, not extra-terrestrials.

Supercalculator (Shadow Prices)

Mathematicians and mathematical economists believe that they can represent the planner's problem and solution mathematically, and some also believe that they can make their representations relevant for real-world action. While the former has a modest element of truth, the latter is false. The idea turns out to be a blind alley, perhaps confirming for some observers the limitations of the mathematical approach

[8]Silly schemes for "market socialism" abound. Roemer (Bardhan and Roemer 1993, p. 89) for example does not define socialism in terms of "public ownership" but "as a system in which there are *institutional guarantees that aggregate profits are distributed more or less equally in the population*" (italics are his). First, Roemer's pseudo-entrepreneurs, pseudo-managers, and pseudo-capitalists would fail to undertake all their exertions if capital income is ultimately divided "more or less equally" anyway. Second, socializing the returns to assets but not asset "ownership" is a distinction virtually without a difference. This means that Roemer (p. 106) is egregiously wrong to assert that he is merely proposing "an economic mechanism that differs quite modestly from the successful capitalist market economies."

[9]Experimental economists are well aware of the difference in human behavior between games with monetary payoffs and without monetary payoffs. Also, Cowen (1994) points out that simulated competition does not remain "simulated" for long.

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to acting man.[10] Ultimately, the mathematical programming approach leads away from real-world economics into theology.

The mathematical approach rests on the claim that economic problems are problems of maxima and minima. Economics, then, is thought to be a playground for mathematics, though the technique never achieved the results that it did in mechanics.[11] As Mises (1963, p. 350) points out "The better method would prove its preeminence by bringing about better results." A major reason for the scientific failure of mathematics to improve our understanding of socialism has been its drive for both "simplicity" and "greater generality" (Debreu 1991, p. 4). Extending the number of goods and techniques from two or three with short processes, and with all the possibilities omnisciently known as might be approximated by an intrafirm transfer pricing problem, to 10^{100} lengthy, roundabout processes and mostly unknown interconnections, is deftly handled by a mere change in notation. Yet it is not merely a change in degree indicated by a change in notation but a change in order of magnitude so enormous that the problem is virtually different in kind. To believe otherwise is to succumb to the simplicity deceit of mathematics. As Polanyi (1951, p. 126) put it, can a cat swim? Yes. Can a cat swim across the Atlantic Ocean? No, it is strictly impossible.

It is possible, of course, to describe the imaginary state of general equilibrium (the evenly rotating economy) or an optimum in terms of differential equations and visualize it in curves. But these are imaginary limiting conditions that say nothing about concrete choice, action, process, and reality. They are a "merely auxiliary construction of theoretical analysis which does not play a role in real action" (Mises 1963, p. 378). Equations and inequalities are only "useful in describing the timeless, static, never-never land of 'general equilibrium'" (Rothbard 1973, p. 47). The real world has properties like sooner and later, cause and effect, and irreversibility of events ("path dependence") among its vital constituents. Functional correspondence is a poor substitute for these logical categories, literally abandoned by the mathematical approach.

What does mathematical activity analysis propose? It sets up the problem with three ingredients: a preference or valuation function over all goods ready for consumption, a complete inventory of available resources (presumably including all consumption goods relevant for production processes—"Leontief constraints"), and all production coefficients (the allegedly unique maximum output level associated with each conceivable production process). Granted, given enough mathematical assumptions about tractability (convexity, etc.) and data, this setup allows the socialist planner to know the impact of all (billions upon billions) conceivable factor assignments on lower order outputs and to choose a preferred combination on this hyperplane or frontier.

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[10]Ronald Coase (1985, p. 185) puts it more lightly: "In my youth it was said what was too silly to be said may be sung. In modern economics it may be put into mathematics." In a more heavy-handed version, Plato said, "I have hardly ever known a mathematician capable of reasoning."

[11]As Leonardo da Vinci (1452–1519) remarked, "Mechanics is the paradise of the mathematical sciences because by means of it one comes to the fruits of mathematics."

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In terms of real application, a practical person might dismiss the entire approach as naive or absurd. A more sympathetic observer might reply that some mathematical economists have gained realistic insights into the price system from this setup. Hicks, for example, says

> the new [mathematical] methods are a great advance upon the old in the understanding which they convey of the *raison d'être* of the price mechanism. The rather inappropriate mathematical methods, which have been employed (at all levels of mathematization) by the school of Cournot and Walras—and of Marshall—did in this respect rather let us down. For they caused it to appear that the price system is just one way of organizing an economy efficiently; that it is, in a sense, exterior to the economic problem, something that is brought in from outside. . . . It has been made apparent, not only that a price system is inherent in the problem of maximizing production from given resources but also that something like a price system is inherent in any problem of maximization against restraints. The imputation of prices (or "scarcities") to the factors of production is nothing else but a measurement of the *intensities* of the restraints—such intensities are always implicit—the special property of a competitive system is that it brings them out and makes them visible. It is through its power of developing the intensities (in the photographic sense of developing), so that they are available for use as instruments in the *process* [italics mine] of maximization, that the competitive system does its job. (1966, pp. 110–11)

Hicks might have added that the "intensities of the restraints" or shadow prices ("imputed value") for all inputs cannot be calculated in practice by a socialist planner for a complex system with vast and lengthy production interrelations. Instead, he erroneously remarks, "One is driven to the conclusion that Linear Programming and the price mechanism are rather close substitutes—both in the things they can do and in those they cannot" (Hicks 1966, p. 99). As Pareto wisely observed in a related context, the purpose of mathematical economics cannot be "to arrive at numerical calculation of prices" because it would be "absurd" to assume that we could ascertain the data (Hayek 1989, p. 5). Of course, even if we had the data, Mises has demonstrated that there is no way for a human being to figure out the scarcity values of the means of production in a complex system.

Despite his mathematical sophistication, Hicks was merely rediscovering Menger's fundamental insight about derived or imputed value from a century earlier:

> The value of goods of higher order is therefore, in the final analysis, nothing but a special form of the importance we attribute to our lives and well-being. . . . But due to the causal connections between goods, the value of goods of higher order is not measured directly by the expected importance of the final satisfaction, but rather by the expected value of the corresponding goods of lower order. (Menger 1976, p. 152)

Only a market system can achieve this coherent set of value interconnections among goods. As the late political scientist Aaron Wildavsky shrewdly noted (quoted in Roberts 1990, p. xv): "The effort of central planners to determine hierarchies of importance is hopeless."

Programming as a guide to efficient choice can only work for small, closed problems with small numbers and short, simple production processes (e.g., diet or

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transportation choices). But this conclusion about the successful scope for programming is entirely consistent with Mises's contention that an isolated household can solve such simple problems tolerably well without market prices for capital goods. Therefore, the modest successes of mathematical programming are not contrary to Mises's impossibility theorem. In addition, the existence of a solution or equilibrium condition (optimum) to a vast problem, even if obtained, would tell the dictator nothing about the most appropriate action (cost-minimization) in new circumstances. That is, an equilibrium assignment tells the director nothing about what to actually do next.

To clarify further, Mises asks whether any mortal, equipped with the capacities of the human mind, would be up to mastering the following problem:

1. The socialist planner has all the technological knowledge of the age at his disposal in the form of a crowd of experts and voluminous reports piled up in his office.
2. He also has a complete inventory of all the material means of production, down to exact locations, and the amounts of usable labor available from another crowd of experts and reports stacked up in his office.
3. He wishes to maximize his own satisfaction, which depends on outputs.

The planner must decide what orders to execute to achieve the highest satisfaction. As Mises states,

> He must choose among an infinite variety of projects in such a way that no want which he himself considers more urgent remains unsatisfied because the factors of production required for its satisfaction are employed for the satisfaction of wants which he considers less urgent. (1963, p. 696)

Could a mere mortal, unaided by market prices for capital goods, solve this calculation problem? Mises answers "No." The socialist planner cannot know what specific actions will accomplish his ends efficiently. There is no known substitute for the system of money prices, the product of a kind of intellectual division of labor all over the globe, in order to achieve an acceptable degree of economy of means, whether the alternative has been proposed by socialists, Communists, mathematical economists, or Roman Catholic Bishops. This is especially true since Mises (1981, p. 121) rejects treatment of the choice problem as a conventional, static (timeless) optimization problem:

> To use a popular but not altogether satisfactory terminology, we can say that the problem of economic calculation is of economic dynamics: it is no problem of statics. . . . the problem arises in an economy which is perpetually subject to change, an economy which every day is confronted with new problems which have to be solved.[12]

The debate over socialism ultimately raises the question of what economists might mean by costless or "perfect" information, knowledge and calculation. Do they mean that everybody knows and understands everything, past, present, and future? In the limit, omniscience on the part of a mere mortal would mean a complete

[12]See note 7 above for sources of perpetual change.

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and universal understanding, a quality theologians might attribute to a Supreme Being but not to humans. Omniscience, as Mises points out, implies that all future events already are unalterably determined. Otherwise, future happenings could not be known with certainty. This creates a logical conflict with a postulate of either individual choice or omnipotence. If the course of events is predetermined, choice by the socialist authority or anyone else is rendered fanciful. Everyone will act in a predetermined way. In this case, the economic problem again has been furtively defined away by a supercomputer device.[13]

Mises's theorem must be accepted for the earthly society in which we live. A vast and complex society with an infinite number of lengthy and roundabout production processes must rely on a real price system for a tolerable degree of economy. And all systems do, in fact, despite extensive political interference with the price system by governments around the world. There is no such thing as a socialist economy, in fact, although it has been seriously tried twice—Soviet war communism 1918–1921 and Cambodia 1975–1979—and in both cases produced chaos and death quickly, lending empirical confirmation to Mises's theorem (Reynolds 1995, pp. 355–59). When there are no private-property rights in labor, and hence no real markets, colossal waste results in terms of the rulers' own aims (Anderson and Tollison 1985).

CONCLUSION

Rational action requires that a decisionmaker's goal be worth more than its costs. The expected result must have a value ranked higher than the costs. Socialism is ruinous because it cannot calculate costs and therefore cannot act rationally with respect to goals. It cannot even choose the least-cost method to accomplish a given goal.

Those opposed to private property, prices, and commerce have to posit an alternative for the sake of economy. They crave planning, socialism, communism, market socialism, and such visions. Unfortunately for them, their wishes will forever be dashed on the rocks of reality. As Wildavsky (Roberts 1990, p. xv) said, an economic system performs tasks "for which central cognition is inappropriate." In such a complicated world, altered daily, there is no alternative to real capital markets. Logic and experience in Russia in 1918–21 and Cambodia 1975–79 demonstrate that economizing is impossible without real prices for capital goods. The socialist planner or director cannot solve the problem of how to assign capital goods to those employments in which they render the best service, even if only the planner's or director's preferences matter. Mises reached the correct, if neglected, conclusion long ago (1981, p. 113): "Where there is no market there is no price system, and where there is no price system there can be no calculation." Mass destruction must ensue.

Economists are well aware of the inefficiencies of the so-called socialist economies observed in the twentieth century. But these nation-states, in fact, operated decentralized systems, used prices and exchange, and relied on market prices to guide decisions. These socialist governments were not a true test of Mises's impossibility theorem.

[13]Might a cynic suggest an odd parallel between mathematical proofs for the existence of efficient socialism and those for the existence of God?

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Instead, they were (and are) interventionist systems like those in the West, only more so.[14]

We can infer from the impossibility of economic calculation under universal socialism that each weakening of private ownership in the means of production (plant closure laws, industrial policy, etc.) moves society further from efficiency and toward poverty and starvation. The irrationality of political assignments displaces economic calculation and value maximization. I cannot offer a general proof here, but note that serious economists continue to call for more central political planning (1977 Nobel Prize winner James Edward Meade 1995) or fixate on various brands of "market socialism" (Archibald 1992; Arnold 1994; Roemer 1994). As Mises (1981, p. 102) warned, "Every step that leads away from private ownership of the means of production and the use of money is a step away from rational economic activity."

Tolerably efficient coordination of human effort is impossible without trade in productive assets (capital markets). There is no demonstrated, superior alternative to Wall Street and the price system. Though most intellectuals recoil from the idea, a logical corollary is that each step away from capitalism is a descent into barbarism, degradation, and irrationality. Experiments in unalloyed socialism have quickly ended in failure. The bones of millions of Cambodians suggest why living human beings will never reach socialism.

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[14]As Polanyi (1951, p. 130) says, "An essential part of that [Russian] policy was to make the world forget the original aim of Socialism and its abysmal failure at its first trial, while trying to dress up as a planned economy a productive system operating through the market."

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APPENDIX A: SOCIALIST CALCULATION EXAMPLE

Consider three methods of producing the same output, Q_o.

	Required Inputs to Produce Q_o.	
Method	K	L
A	2	10
B	4	6
C	8	3

Time Period	Prices per Unit Input	
t_o	P_K=\$4	P_L=\$1
t_1	P_K=\$3	P_L=\$2

How can we economize on resource consumption throughout the system and yet accomplish a given task?

UNDER CAPITALISM: Market (scarcity) prices give reasonably accurate indicators of the social opportunity costs of inputs in terms of consumption value sacrificed elsewhere.

To minimize total cost, $TC=p_KK+p_LL$

@t_o Method A: \$4x2+\$1x10=\$18
Method B: \$4x4+\$1x6=\$22
Method C: \$4x8+\$1x3=\$35

A is minimum cost @ t_o, that is, the least expensive method to produce Q_o, and therefore A reduces value elsewhere by the least amount.

@t_1 Method A: \$3x2+\$2x10=\$26
Method B: \$3x4+\$2x6=\$24
Method C: \$3x8+\$2x3=\$30

Under the new scarcity prices, method B, which is more capital intensive and less labor intensive than method A, minimizes cost.

UNDER SOCIALISM: The planner does not know the market prices of capital goods and services, so the simple calculations of least-cost methods available under capitalism are not available. He can choose A, B, or C based on "intuition" rather than calculation at the time t_0, t_1, or t_n, but it is a "leap in the dark." What substitute measures could be used to guide economical decision making, especially under continually changing conditions in a vast, complicated system with millions of methods, input interrelations and interdependencies with lower order goods? The central planner is blind without reliable "shadow prices" for the opportunity costs of millions of units of capital.

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ENTREPRENEURSHIP AND ECONOMIC GROWTH

RANDALL G. HOLCOMBE

What causes economic growth? At the risk of some oversimplification, the answers economists have given to this question can be divided into two broad camps, one following the ideas of Adam Smith (1776) and the other following the ideas of David Ricardo (1821). Smith, whose overriding goal was to understand the wealth-creation process, began his treatise with the lesson that the division of labor is limited by the extent of the market. As markets grew, entrepreneurship would lead to innovation, which would lead to an increasing division of labor and increased productivity. Ricardo, in contrast, envisioned economic output as being a function of the inputs of land, labor, and capital. Investment could produce more capital, but because of diminishing marginal factor productivity and the existence of fixed factors such as land, population growth would always dominate economic growth, keeping most of the population at a subsistence level of income. The ideas of Ricardo and his friend and contemporary Malthus (1798) created the view of economics as the dismal science, which contrasts sharply with Smith's view of entrepreneurship and innovation that would lead to ever-increasing wealth.

This characterization of Smithian and Ricardian growth is an oversimplification in the sense that both authors had a deeper understanding of the growth process than the above characterization reveals. In one sense, it is unfair to Smith and Ricardo because it does not take account of the richness of their views and insights. In another sense, however, it is an eminently fair characterization. After all of their analysis of the process of economic growth, Smith ultimately concluded that the potential for economic growth was virtually unlimited, whereas Ricardo viewed the potential for economic growth as limited by the availability of economic resources (and in particular, land). If it is possible to contrast the ideas of various economists at all, it is certainly fair to charaterize them according to their ultimate conclusions.

With hindsight, Smith's vision of economic growth was more accurate than Ricardo's, but the economics profession has followed Ricardo more closely than Smith in developing a theory of economic growth. Part of the reason is that the

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comparative static nature of economic modeling has made the production function approach of Ricardo amenable to economic modeling, whereas the innovation that leads to an increased division of labor is more difficult to model precisely. As economics has become more scientific over the twentieth century, economists have been more ready to attack problems that fit into a general equilibrium model of the economy than those that are more difficult to parameterize.[1] In the Ricardian production function approach, investment is the key to economic growth, whereas in the Smithian view, innovation leading to increases in the division of labor is the key. The Smithian answer seems right, but Smith did not explain the process by which that innovation occurs. Kirzner (1973) provides an important insight in this regard, by describing entrepreneurship as the process of acting upon a previously unnoticed profit opportunity. Thus, Kirzner's entrepreneurship can provide an engine to drive Smithian economic growth.

As Kirzner sees it, entrepreneurial insights are profit opportunities that had previously gone unnoticed. Entrepreneurs act upon these insights and the economy becomes more productive because it is able to produce more consumer satisfaction at a lower cost. The connection between entrepreneurship and economic growth is that these previously unnoticed profit opportunities must come from somewhere, and the most common source of profit opportunities is the insights of other entrepreneurs. Entrepreneurial ideas arise when an entrepreneur sees that the ideas developed by earlier entrepreneurs can be combined to produce a new process or output. Entrepreneurial opportunities tend to appear within the context of a specific time and place, so following Hayek (1945), a decentralized economy that allows individuals to act on their entrepreneurial insights, and rewards them for doing so, produces an environment where additional entrepreneurial insights are likely to be produced. Looked at in this way, entrepreneurship is the foundation for economic growth. Entrepreneurial insights lay the foundation for additional entrepreneurial insights, which drive the growth process.[2]

Before discussing the details of economic growth, it is worth drawing a distinction between the process of economic growth and the environment within which growth takes place. After the collapse of the centrally planned economies in Europe beginning in 1989, it is apparent that a market environment is more conducive to economic growth than is a centrally planned environment, and empirical analysis confirms this observation.[3] This issue of the role that markets play in the process of

[1]As one observer has said, "When the only tool you have is a hammer, everything looks like a nail." The economics profession's approach to economic growth reminds one of the old joke about the man who is standing under a streetlight looking for his keys when another man offers to help him. "Where did you drop them," the helper asks. "Across the street," the man answers. "Then why are you looking here?" "The light is better." This article heads where the light is not so good, but where the answer is more likely to be found.

[2]Schumpeter (1934, p. 154), discussing a framework in which all profit is competed away in a competitive equilibrium, and in which profit is the return to entrepreneurship, observed, "Without development there is no profit, without profit no development." While this sentiment captures the way in which entrepreneurship leads to growth, Kirzner notes some differences between his approach and Schumpeter's, which are discussed below.

[3]See, for examples, Gwartney, Lawson, and Block (1996), Scully (1988, 1992), and Knack (1996). See also Olson's (1996) insightful discussion of institutions and economic growth.

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growth is relevant to the public-policy question of what institutions foster economic growth, but is peripheral to the more theoretical issues considered here. The question considered in this article is how, within a market setting, economic growth occurs. The answer, in a sentence, is that acts of entrepreneurship create an environment within which innovations build on themselves, leading to continually increasing productivity.

SMITHIAN VERSUS RICARDIAN GROWTH

Perhaps the simplest way to differentiate Smithian from Ricardian growth within the setting of contemporary economics is to use the Solow (1956) growth model as a framework. If output in year t is denoted Y_t, and capital and labor are represented as K_t and L_t, Solow envisioned output as a function of capital, labor, and time,

$$Y_t = F[K_t, L_t, t],$$

with time entering the production function, because over time technology can advance, making a given amount of capital and labor more productive. This simple mathematical formulation allows considerable development by making simple assumptions about the production function.[4] The model can be used to derive the "golden rule" growth path, which implies that there is an optimal amount of investment, and can be used as a foundation for showing "convergence," which is the idea that economies with lower per capita incomes should grow faster than those with higher per capita incomes, so that over time incomes will converge. In fact, convergence has not occurred, casting some doubt on the basic framework of the Solow model, and creating its own strand of literature on convergence.[5]

Within the Solow model it has been relatively easy to formulate mathematical relationships among Y, K, and L, but modeling the effect of t has been more problematic, so it has often been treated as exogenous over time. Often, L is also treated as exogenous, and if one is considering per capita income, it is easy to divide by L, leaving only K and the exogenous t as explanatory factors.[6] The implication is straightforward. By investing, K can be increased, which will increase Y. This provides the foundation for the Ricardian view of economic growth.

The Ricardian model of growth has been taken seriously by both economists and policy makers. As Kreuger (1993) notes, it was at the foundation of world economic development policy for three decades after World War II, and application of the

[4]Barro and Sala-i-Martin (1995) give a good exposition of the ways that the Solow model has been developed, and the implications that have arisen from the model. Barro and Sala-i-Martin use the production function given here to depict the Solow model, although another specification would have been $Y_t = \lambda_t[K_t, L_t]$. This seems to suggest a constant rate of change over time for λ, however, which is clearly at odds with the evidence.

[5]Quah (1996) presents empirical evidence showing that national incomes are becoming bimodal, with some nations converging at high levels of income while others stagnate at low levels. Quah suggests, based on the evidence, that under the right conditions nations can converge as the Solow model suggests, but that low-income nations do not exhibit the right conditions.

[6]Of course, in the general functional form above, dividing by L may not eliminate it from the right side of the equation, but it would eliminate population growth per se as a factor in income growth.

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Ricardian model points out the advantages of central planning over market allocation, because planners are in a better position both to increase a nation's saving and investment rate, and to direct investment toward those sectors that can be most productive. Yet, despite the advice of economic growth theorists, undeveloped economies remain undeveloped even though they have undertaken substantial investment initiatives. Furthermore, the data make clear that only a small part of economic growth can be explained by increases in investment. The answer must lie somewhere else.

The problem with the Solow framework is that the most reasonable alternatives for the causes of growth are K or t, and the effects of capital are easy to analyze, so they have been analyzed extensively, whereas the effects of time are nebulous and hard to analyze, so they have tended to remain exogenous. In fact, it is unlikely that time, by itself, causes growth, but rather something else that changes over time. That something else has been called technological change and, as the other alternative in the Solow framework, has itself come under close scrutiny. There is, for example, a substantial literature on research and development, under the thought that R&D can increase productivity over time.

Other avenues might be taken within the basic Ricardian framework. Jones and Manuelli (1990) find that under different constraints, a Ricardian model need not imply convergence, suggesting that this framework might be able to be rehabilitated to conform more closely with reality. Taking a different tack, Lucas (1988) suggests that the key may be L, not K, and that in particular human capital can play the major role in development. Toward the end of his paper, Lucas discusses the idea of the external effects of human capital, and suggests that a higher population density may result in a finer division of labor and that the human capital of one person may make others more productive. Thus, Lucas begins moving the Ricardian framework toward a Smithian view of economic growth.

The Smithian view of growth focuses less on the quantities of factors of production and more on the processes that are used to combine them into aggregate output. Young (1928) viewed economic growth as occurring because of increasing returns, and explicitly recognized the Smithian foundations of his analysis, but increasing returns does not sit well in the neoclassical framework, as Kaldor (1972) argued. In frequently cited articles, Paul Romer has steered the literature in a neoclassical direction. Romer (1986) shows that growth can be modeled with a factor having increasing returns, and that in such a model growth rates need not converge over the long run, which fits the facts better than the simple Solow framework. Romer (1990) focuses attention on human capital, and argues that additional investment in research could promote more economic growth. Like earlier developments from the Solow model, however, this line of reasoning focuses on the inputs into the production process rather than the process itself.

THE PRODUCTION PROCESS

The most basic facts of economic growth weigh against focusing on the inputs into the production process, and point toward an examination of the process itself. Within the neoclassical framework, changes in the production function have had a bigger

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impact on economic growth than changes in the inputs into the production function. The quantity and quality of both human and physical capital are important, beyond a doubt, but they are a product of an economy and not factors given exogenously to it. Both existed in abundance in ancient China, and even today the pyramids of Egypt (physical capital) and the knowledge of Leonardo da Vinci (human capital) inspire awe, yet economic growth, as it is understood today, is a recent phenomenon. Blanchard and Fischer (1989, pp. 1–2) note, "real GNP is about 37 times larger than it was in 1874, 7 times larger than in 1919, and 3 times larger than in 1950. Extrapolating backwards leads to the well-known conclusion that economic growth at these rates cannot have been taking place for more than a few centuries." Land, labor, and capital long predate the transformation to economic growth. It is the process by which they are combined that has created sustained economic growth.

Rather than viewing production in a Ricardian production function setting, Böhm-Bawerk (1959) depicted a structure of production that would become more roundabout as more indirect methods of production were used. Böhm-Bawerk's ideas about heterogeneous capital and more roundabout methods of production have remained an integral part of Austrian capital theory (Hayek 1941), and have, among other things, been applied to explain business cycles (Hayek 1933, 1935) and even to illuminate the process of economic growth (Kirzner 1986). This literature, which focuses on incentives for altering the production process, also has implications for the ways in which entrepreneurs discover new production processes. Within the Solow framework, the new production processes fall within t in the production function, and the effect of t is generally viewed as working through technological change. That still leaves the question of what produces technological change.

ENTREPRENEURSHIP AND TECHNOLOGICAL CHANGE

Within a neoclassical framework, where things are produced by combining inputs in a production function, the most straightforward way to get technological change is to produce it. Research and development can be undertaken by combining land, labor, and capital, to produce technological change. The successes attributable to investment in research and development are indisputable, but research-and-development expenditures cannot be the whole story, because once the research is done, the results need to be applied to make production less costly, or even more mysteriously, to produce goods and services that have never been produced before. This is the role of entrepreneurship.

Kirzner (1973) depicts entrepreneurs as people who are alert enough to spot previously unseen profit opportunities and then act on them. As Kirzner describes it, entrepreneurship involves noticing something that nobody has noticed before. However, some people are in a better position to notice certain profit opportunities than others. Those with training in mechanical engineering are more likely to spot potential profit opportunities in the design of internal combustion engines than those with training in law, for example, and somebody who never goes to the beach will not be in a position to notice the opportunity to open an ice-cream shop or T-shirt shop there. People who travel a lot might notice opportunities because of the amenities they find in one place that might not be available in another. There is, for example, an opportunity for the person who notices that a profit might be made in

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Indianapolis by offering a service similar to one already available and profitable in Cincinnati. Thus, there is more of a relationship between Hayek's (1945) view of the use of knowledge in society and Kirzner's vision of entrepreneurship than at first is apparent.

Entrepreneurial alertness is itself unrelated to knowledge, and is costless in the sense that it does not use up resources. However, one's past activities do influence one's ability to recognize an opportunity when one presents itself, as the examples in the previous paragraph suggest. All individuals have knowledge specific to their own activities—knowledge of time and place that others do not share. This specific knowledge of time and place gives some people the chance to notice profit opportunities that others could not possibly see. How does it happen that one can see a profit opportunity that nobody before has noticed? In part, it has to do with the differences in knowledge that different individuals possess. For example, it was not a coincidence that the microprocessor was invented by an electrical engineer and not a poet. Of course, knowledge does not create entrepreneurial insight, but it does create the opportunity to notice things that could not be noticed without that knowledge, which creates a direct connection between Hayekian knowledge and Kirznerian entrepreneurship. Economic theory biases economists against thinking that it is possible to come upon previously unexploited profit opportunities, because in neoclassical competitive equilibrium, all profit opportunities have been competed away.[7]

In fact, most profit opportunities get noticed by entrepreneurs because they are new. This is true whether the entrepreneurial successes are spectacular or more mundane. Consider some great American fortunes. Andrew Carnegie was able to build the foundations of U.S. Steel by capitalizing on the newly developed Bessemer process. John D. Rockefeller's Standard Oil Company developed because he was able to control the distribution network, which at the time relied on the recently constructed railroad infrastructure. Henry Ford's assembly lines were feasible only when there was enough of a mass market for automobiles. The fortunes of Bill Gates rose along with the fledgling personal computer industry. None of these individuals invented the technology that made them wealthy, but they had the insight to take advantage of an entrepreneurial opportunity. Note, however, that in each case the opportunity was newly developed, and the entrepreneurial opportunity did not go unnoticed for long. Entrepreneurial opportunities are not just lying around waiting for someone to notice them. Rather, they appear and then entrepreneurs rapidly move to take advantage of them.

Where do entrepreneurial opportunities come from? Many of them come from the actions of other entrepreneurs. Henry Ford could not have succeeded in mass-producing automobiles until there was a substantial market, including infrastructure such as roads, gasoline stations, and repair facilities. Bill Gates could not have made his fortune had not Steve Jobs seen the opportunity to build and sell personal computers, and Steve Jobs could not have built a personal computer had not Gordon

[7]An economist joke, repeated in Olson (1996), illustrates the point. Two economists, an assistant professor and a full professor, are walking down the street. Assistant professor: "Hey, there's a $20 bill on the sidewalk." Professor: "Couldn't be. If there was, somebody would have picked it up."(In order to retain an air of seriousness, this article has relegated all of its jokes to footnotes.)

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Moore invented the microprocessor. When entrepreneurs take advantage of profit opportunities, they create new entrepreneurial opportunities that others can act upon. Entrepreneurship creates an environment that makes more entrepreneurship possible.

INCREASING RETURNS AND KNOWLEDGE EXTERNALITIES

The Smithian view of economic growth is based on the concept of increasing returns, and twentieth-century contributors to the Smithian idea, like Young (1928) and Kaldor (1972), have explicitly acknowledged that they were building on Adam Smith's insights. Yet increasing returns is a problematic concept in an economic framework because it implies that average cost continually declines. Kaldor (1972) notes the problems for general equilibrium models when firms are characterized by increasing returns, but another possibility is that the production functions of firms do not exhibit increasing returns, but firms generate positive externalities that lower the costs of production for other firms in close proximity. Individual firms do not exhibit increasing returns, but the entire economy does. This is easy to visualize as a Smithian idea. The division of labor is limited by the extent of the market, so additional firms in an area enlarge the market and allow all firms to be more productive by becoming increasingly specialized. Increased specialization is but one way in which firms can become more innovative, so a more general way to envision this idea is that the knowledge created by firms benefit other firms in close proximity, so that when one firm innovates, others find themselves in a better position to innovate also.

Romer (1986, 1990) depicts the process as a knowledge spillover. Knowledge, embodied in human capital, is the factor with increasing returns, meaning that investments in human capital make future investments in human capital more productive. Because human capital must be combined with other factors of production, there will be a tendency for productivity increases to be geographically concentrated, which result in some areas manifesting more economic growth than others.[8] This raises two questions, only one of which will be dealt with here. The first is, what conditions cause economic growth to be concentrated in some areas but not in others? A plausible answer, but outside the scope of the present article, is that market institutions make the difference.[9] The second question is, by what process does the productive activity of some result in a positive externality that increases the productivity of others? This is the question that Kirzner's model of entrepreneurship answers.

Kirzner clearly distinguishes between knowledge and entrepreneurship.

[8]See Krugman (1991) and Audretsch and Feldman (1996) for models in which increasing returns occur in geographically concentrated areas.

[9]Gwartney, Lawson, and Block (1996), Olson (1996), Scully (1988, 1992), and Knack (1996) are some examples of studies that come to this conclusion. Scully uses a measure of economic and political freedom, while Gwartney, Lawson, and Block deliberately confine their analysis to economic freedoms. Barro (1996) and Perotti (1996) present some evidence that economic freedoms are what count, and that democratic political institutions may even have a negative effect on economic growth.

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> But as closely as the element of knowledge is tied to the possibility of winning pure profits, the elusive notion of entrepreneurship is, as we have seen, not encapsulated in the mere possession of greater knowledge of market opportunities. The aspect of knowledge which is crucially relevant to entrepreneurship is not so much the substantive knowledge of market data as *alertness, the "knowledge" of where to find market data.* (1963, p. 67, emphasis in original)

Entrepreneurship, in Kirzner's vision, clearly excludes research and development activities, and the accumulation of human capital. These activities can augment factors of production, but by themselves do not provide the insights that lead to new goods and services, or new processes for producing existing goods and services. If this seems like an overly fine distinction, consider the policy implications. Centrally planned economies tried unsuccessfully for decades to produce growth through investment in research and education, but were missing the institutions that enabled entrepreneurship.

THE PROCESS OF ENTREPRENEURSHIP

One might imagine an entrepreneur spotting a profit opportunity in the same way that a pedestrian spots a $20 bill on the sidewalk. Many people might walk by the bill, not noticing it, until one alert individual spots it and reaps the $20 reward. This analogy fits Kirzner's model of entrepreneurship in some respects, but falls short in others. One problem with the analogy is that it is rare to find money on the sidewalk, so there is little incentive to look for it. In contrast, it is not uncommon, for example, to find scavengers with metal detectors on a beach looking for lost watches, rings, and other valuables. If more money were lying on sidewalks, people would become more alert to the opportunity of finding it. The idea that people will be more alert for profit opportunities when they are more likely to exist helps illuminate the reason why more profit opportunities are seized in growing economies. Economic growth creates profit opportunities.

When economies are organized around traditional lines, people's economic roles are given and there is little possibility for capitalizing on innovation. The ancient Chinese economy had more capital than other economies at the time, had a well-developed legal system, had well-defined property rights, and had advanced the state of knowledge further than any other place in the world. Yet the traditional nature of the economy meant that individuals found their employment dictated by historical factors outside their control, and more significantly, found little change in the status quo over the course of their lifetimes.[10] When the status quo changes relatively little, one is not likely to spot an entrepreneurial opportunity today that was not apparent yesterday. Even a substantial opportunity will tend to blend in with the status quo, and because it is familiar, will tend to go unnoticed. This is one reason why economies organized along traditional lines tend not to grow, even when they have substantial endowments of basic factors of production, when they are technologically advanced, and when their population has substantial human capital.

[10]Heilbroner (1962) divides economic systems into traditional, command, and market economies, and that is the distinction used here when discussing economies based on tradition.

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This observation holds not only for traditional economies, but for market economies too, if they are unchanging. Consider the neoclassical concept of general equilibrium in which all firms are pricing at minimum average costs and there are no economic profits to be had. By definition, entrepreneurs have no profit opportunities to find; they have all been exploited already. Starting from this situation of general equilibrium, one can see that if an innovation occurs that disturbs the equilibrium, it opens profit opportunities in other areas of the economy. If a new good is introduced, consumers will shift their purchases toward that good, creating profits for some and losses for others. Those who sell complementary goods have a profit opportunity, and once a new good is produced, it may produce the opportunity for others to introduce new complementary goods for which there would not have been a market before. New production processes can be developed for the new goods, and the innovative opportunities go on.

This example points toward two shortcomings of analyzing economic growth in a general equilibrium framework. First, the models are not well suited for depicting the process of introducing new goods into the economy. In the neoclassical framework, growth occurs by producing more of the old goods. Second, because they are equilibrium models, they do not depict the profit opportunities that entice innovation. Thus, innovation tends to be depicted as research-and-development activity that is produced by applying inputs in a production function, rather than as an entrepreneurial discovery process. If one imagines the activities of those who run the black boxes that are firms in such models, they must be imagined as managers, whose job it is to combine pre-specified inputs into pre-specified outputs in a Pareto-efficient manner, rather than being entrepreneurs who innovate by undertaking production in a previously untried manner, producing goods that have not previously been produced, aiming at markets that do not yet exist.

There is some merit to considering research and development as a component of innovation and entrepreneurship, in the same way that one considers the purchase of a metal detector as a method for finding objects on the beach.[11] If there are not very many entrepreneurial opportunities, it does not pay to look for them, but when entrepreneurial opportunities abound, it makes sense to invest in the search for entrepreneurial profits. But focusing on research and development as the main component of innovation and technological advance misses the point. In most cases, a metal detector will not help people find lost objects, so one rarely sees people with metal detectors searching for lost objects in shopping centers, apartment buildings, or schools. On the beach, however, lost objects are more likely to be hidden from view in the sand, and because beachgoers do lose objects with some regularity, using a metal detector on a beach may turn up valuable objects. Similarly, research-and-development activity takes place in those areas where entrepreneurial profits seem promising. Research and development expenditures are not the cause of entrepreneurial opportunities, they are the result of entrepreneurial opportunities. More

[11]Note, however, that Kirzner (1973, p. 40) would make the distinction between the entrepreneurial insight that a metal detector might be used to discover previously undiscovered profit opportunities, which requires no resources, and the investment in the metal detector, which is the employment of capital in the production process.

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research and development occurs in the electronics industry than in the garment industry because there are more potential entrepreneurial insights to be found in electronics than in garment manufacture.

Thus, while it is reasonable to consider research and development to be a factor pushing technological change, research and development is not the cause of growth, it is a response to growth opportunities. The question is, what creates such opportunities? The answer is: entrepreneurship. In a static setting, where there is little change, there will be relatively little in the way of entrepreneurial opportunities. Those that might be lying in wait must be relatively obscure to have remained unnoticed, and the static environment precludes the creation of new opportunities. Furthermore, with few opportunities, there is little incentive to devote any resources toward seeking them out. In an environment of economic change, new opportunities will continually be presenting themselves. When entrepreneurs take advantage of some opportunities, the economic environment changes, creating with it additional opportunities. Thus, entrepreneurship leads to more entrepreneurship.

Several factors lead entrepreneurial insights to build on one another. First, the changes that result from entrepreneurship alter the economic environment, creating new profit opportunities. This is easy to see even within a comparative static general equilibrium setting. If the equilibrium is upset, the equilibrium condition that eliminates profit opportunities is removed, and profit opportunities arise to lead the adjustment to a new general equilibrium. Second, entrepreneurial activity generates wealth, and thereby increases the extent of the market, to use Adam Smith's phrase. The increase in income alone will generate new market opportunities, but an increase in the volume of goods also produces the opportunity for greater specialization. Third, entrepreneurial insights create new market niches that go along with innovation. This third factor, the creation of market niches, is the key link between entrepreneurship and economic growth.

Consider, for example, one innovative insight in the rapidly developing computer industry. Somebody had the idea that if a computer mouse communicated with the computer via an infrared connection, the mouse could be used without a cord. It is a small development, to be sure, but it is a good example of an entrepreneurial insight and the capitalization of a previously unnoticed profit opportunity. The profit opportunity arose solely because of a previously nonexistent market niche, and once that market niche appeared, it did not take very long for an entrepreneur to seize on the idea. Notice that this entrepreneurial insight did not arise for either of the first two reasons listed in the previous paragraph. It did not arise because of a profit opportunity created by a temporary disequilibrium in the market. Before personal computers used mice (which also is an example of an entrepreneurial insight), there would have been no possibility for the insight, regardless of how far the market was out of equilibrium. It did not arise because of the second reason either, which is a bigger market. The division of labor has nothing to do with the insight that a mouse could communicate with a computer through infrared technology (although it might have something to do with what type of firm produces the technology). An increase in wealth could not create the demand for infrared mice without the innovation of the mouse as a computer input device. This entrepreneurial insight capitalized on a new opportunity, which was created by other entrepreneurial insights.

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One can go through a chain of events, seeing that the entrepreneurial insight that led to infrared mice could not have been made without the insight that a mouse could be used as a computer peripheral, and the insight that a mouse could be used to control a computer could not have been made without the insight that there was a market for personal computers. As is well known, the major computer manufacturers of the 1970s completely overlooked this market, leaving it to entrepreneurial start-ups. And the insight that there is a market for personal computers could not have been made without the development of the microprocessor, a result of yet another entrepreneurial insight. The computer industry provides a good example of the way that entrepreneurial insights lead to additional entrepreneurial insights. The economy does not simply offer a fixed set of entrepreneurial opportunities which then can be harvested. Rather, new entrepreneurial opportunities continually arise as the result of past entrepreneurial activity.

This does not imply that one cannot invest in looking for entrepreneurial opportunities. Research and development, and the production of human capital, can be systematic ways of producing additional opportunities, and of finding those that already exist. That specific knowledge of time and place that Hayek emphasized can play a role in revealing entrepreneurial opportunities. However, if one focuses exclusively on investment in human capital and technological advance, the mechanism by which innovation occurs is left out of the picture entirely. Such investments can produce a more fertile environment within which to search for entrepreneurial opportunities, but it is the entrepreneurial act of seizing those opportunities that produces the engine for economic growth, and that lays the foundation for more entrepreneurial discoveries.[12]

To see that this is true, one need only look at the centrally planned economies of the twentieth century. Those economies placed a big premium on the development of both human and physical capital, and on the production of advances in technology. Their collapse at the end of the twentieth century shows that it is not the advancement of human capital, physical capital, and technology by itself that leads to economic growth, but rather the environment within which these advances take place. Hayek (1945) emphasized the specific knowledge of time and place possessed by every individual in the economy, and when the economy allows every individual to take advantage of this knowledge and become entrepreneurial, economic growth is the result. Centrally planned economies failed because central planning precludes entrepreneurship, which is necessarily decentralized in nature.

The market system produces this setting, and entrepreneurship within the market setting that makes the process work. Innovations produce profit opportunities which are then seized by entrepreneurs, and those entrepreneurial activities create more profit opportunities.

IMPLICATIONS FOR KIRZNER'S MODEL OF ENTREPRENEURSHIP

The linking of entrepreneurship with the environment of economic growth helps to illuminate the process by which entrepreneurial opportunities arise, and the process

[12]Weitzman (1996) outlines a theory of growth along these lines.

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by which they are observed and acted upon. While, in a sense, profit opportunities lie unseen until entrepreneurs observe them and capitalize on them, profit opportunities are not like a fixed stock of resources waiting to be claimed. Rather, they arise in the course of economic activity, and in many cases are seized shortly after they appear. Most entrepreneurial opportunities are created as a result of past entrepreneurship. Seeing entrepreneurship within the context of economic growth helps clarify the origin of entrepreneurial ideas, and the way in which entrepreneurs are able to spot them and act on them.

A view that opportunities for entrepreneurial insights are produced exogenously and lie in wait for entrepreneurs to notice them is fundamentally misleading. Furthermore, it would be misleading to think that at any moment in time there is an abundance of entrepreneurial opportunities that are unnoticed, waiting to be discovered. Entrepreneurial opportunities constantly arise in a growing economy, and when they do they are, except in rare circumstances, rapidly acted upon. Entrepreneurial insights are produced in the process of economic advancement. More rapid advancement brings more entrepreneurial opportunities, and more entrepreneurial opportunities produce greater incentives for potential entrepreneurs to become more alert to them. Entrepreneurship generates more entrepreneurship. In contrast, a stagnant economy blunts the incentives for entrepreneurial activity, and can remain stagnant because of the lack of entrepreneurial opportunities.[13]

If one wanted to focus solely on the activities of entrepreneurs, then entrepreneurial opportunities might be viewed as exogenous creations that entrepreneurs act upon. However, when one extends Kirzner's model of entrepreneurship to examine its results, it is a straightforward conclusion that entrepreneurial activities create more entrepreneurial opportunities. This has the advantage of endogenizing the creation of entrepreneurial opportunities, so that Kirzner's model then explains the origin of entrepreneurial opportunities as well as the competitive process that results from their existence. When one sees that entrepreneurial insights build upon one another, the creation of entrepreneurial insights is endogenized and the Kirznerian model of entrepreneurship becomes more complete.

Kirzner (1973, pp. 72–75) distinguishes his view of entrepreneurship, which he envisions as equilibrating, with Schumpeter's (1934), which he depicts as disequilibrating. "Schumpeter's entrepreneur acts to *disturb* an existing equilibrium situation. . . . The entrepreneur is pictured as *initiating* change and generating new opportunities" (pp. 72–73, emphasis in original). Kirzner then quotes Schumpeter as concluding that entrepreneurship is at odds with equilibrating activity. Kirzner, in contrast, argues that the entrepreneur "*brings into mutual adjustment* those discordant elements which resulted from prior market ignorance" (p. 73, emphasis in original). Kirzner takes issue with Schumpeter because his discussion of entrepreneurship is "likely to generate the utterly mistaken view that the state of equilibrium can establish itself

[13]Young (1993) develops a model along these lines. Mokyr (1990) classifies technological advances as "macroinventions" and "microinventions." The idea is that major inventions like the steam engine and the microprocessor create entrepreneurial opportunities for microinventions that further drive economic growth.

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without any social device to deploy and marshal the scattered pieces of information which are the only source of such a state" (pp. 73–74).

When Kirznerian entrepreneurship is considered within the framework of economic growth, however, there may be more common ground between Kirzner's and Schumpeter's views on entrepreneurship than Kirzner implies in the above passages. Kirzner's entrepreneurs explicitly begin their activity within a disequilibrium situation.

> It is necessary to postulate that out of the mistakes which led market participants to choose less-than-optimal courses of action yesterday, there can be expected to develop systematic *changes in expectations* concerning ends and means that can generate corresponding *alterations in plans.* (1973, p. 71)

In such a situation, entrepreneurial insights would bring individuals closer and closer to their optimal courses of action, eventually causing entrepreneurial opportunities to vanish. However, new opportunities could arise from Schumpeterian entrepreneurship, which would create a disequilibrium situation with new profit opportunities for Kirznerian entrepreneurs to act upon.

In fact, there is no difference between the actions of Kirznerian and Schumpeterian entrepreneurs. Both are seizing unexploited profit opportunities, and in both cases the market environment will be different for all market participants in the future. One must note, however, that in any developing economy, the equilibrium toward which the economy tends changes from day to day, and when the Kirznerian model is expanded to recognize this, the tendency toward equilibrium in a static sense is less important than the exploitation of new profit opportunities which implies greater gains from trade and economic growth. The difference that Kirzner emphasizes between his and Schumpeter's views largely arises because of the different objectives of the two writers. Schumpeter was discussing directly the role of entrepreneurship in economic growth, while Kirzner was interested in showing how entrepreneurship is an essential but underrecognized element in the allocation of economic resources.[14]

Schumpeter's discussion of entrepreneurship flows from his vision of economic growth as a spontaneous, revolutionary, and discontinuous process,[15] implying that the motive forces of growth are exogenous to his model of growth, if not to the economic process itself. From an initial equilibrium, entrepreneurial activity disturbs that equilibrium, leading Schumpeter to the idea that entrepreneurial activity is disequilibrating. Kirzner begins from a disequilibrium condition to show how entrepreneurial activity helps equilibrate an economy. Neither view is complete, because in Schumpeter's model some force must equilibrate an economy before entrepreneurial

[14]Kirzner (1979, ch. 7) argues that there are important differences between his and Schumpeter's ideas, and takes Schumpeter to task for not discussing the equilibrating role of entrepreneurship. Elsewhere, however, Kirzner (1985, ch. 4) develops the idea of entrepreneurship in a manner that encompasses the spirit of Schumpeter's ideas, and in private correspondence Kirzner has told me that he believes Schumpeter's ideas on entrepreneurship are important, and that they can be reconciled with his ideas.

[15]Schumpeter (1934, p. 63) discusses the revolutionary nature of economic growth, and later (1934, p. 65) describes the motive forces as "spontaneous and discontinuous."

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activity can disequilibrate it, and that force is Kirznerian entrepreneurship. Likewise, in Kirzner's model, if entrepreneurial activity continually works to equilibrate an economy, some force must push it away from equilibrium to allow the equilibrating process to operate, and that force is Schumpeterian entrepreneurship. Both forces have the same origin, however, which is entrepreneurs acting on previously unrecognized profit opportunities.

Kirzner is justly concerned that Schumpeter ignores the equilibrating role of entrepreneurship, but at the same time Schumpeter does correctly note that entrepreneurial activity is essential for growth. But Kirzner's theory of entrepreneurship gives no indication of the origin of entrepreneurial opportunities, and when Kirznerian entrepreneurship is depicted as an integral part of the process of economic growth, entrepreneurial opportunities can be seen as originating from past entrepreneurial activity, making Kirzner's theory of entrepreneurship more self-contained and complete.

IMPLICATIONS FOR GROWTH THEORY

While growth theory has become far more formalized in the last half of the twentieth century, the fundamental ideas behind the engine of economic growth can be traced back to Adam Smith. As noted in the earlier review of the literature, current theorists are focusing on the role of human capital, knowledge externalities, and increasing returns. These insights certainly are not wrong, but at the same time they do not go very far toward illuminating the process by which knowledge externalities produce growth, or by which increasing returns can be manifested in the production process. The recognition of entrepreneurship's role in the market process fills this gap. Knowledge externalities occur when the entrepreneurial insights of some produce entrepreneurial opportunities for others. Increasing returns occur because the more entrepreneurial activity an economy exhibits, the more new entrepreneurial opportunities it creates.

When one recognizes that entrepreneurship gives rise to knowledge externalities and increasing returns, it then becomes apparent that growth theory should focus less on the Ricardian production function approach where inputs are combined in a black box to produce outputs, and more on the process by which production processes are determined. The engine of economic growth is not better inputs, but rather an environment in which entrepreneurial opportunities can be capitalized upon. As Kreuger (1993) notes, for decades after World War II, the production-function approach dominated economic thinking, and economic policy advisors, applying state-of-the-art growth theory, advised nations to industrialize, to save and invest, and to develop their human capital. The result has been that many third-world nations have inefficient industries that require constant subsidies to keep them running, further draining their economies. They have tried educating their citizens, but because of lack of opportunities, many of their better minds have emigrated to other countries. The biggest beneficiaries of the whole process may have been the high-priced consultants who recommended these inefficient growth strategies.

When entrepreneurship is seen as the engine of growth, the emphasis shifts toward the creation of an environment within which opportunities for entrepreneurial activity are created, and successful entrepreneurship is rewarded. Human and physical capital remain inputs into the production process, to be sure,

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but by themselves they do not create economic growth.[16] Rather, an institutional environment that encourages entrepreneurship attracts human and physical capital, which is why investment and growth are correlated. When the key role of entrepreneurship is taken into account, it is apparent that emphasis should be placed on market institutions rather than production function inputs. The importance of market institutions has now been generally recognized in practice, but has not been integrated into the mainstream theory of economic growth.

Contemporary growth theory, built on complex mathematical models, must make simplifying assumptions to keep the models tractable. In the process of simplifying models to make them more manageable, it is easy to assume away the institutional details that provide the foundation for economic growth. The temptation to assume away these institutional details is increased because often institutional details are hard to measure. One can come up with plausible measures for capital and labor, but it is more difficult to measure the degree to which property rights are protected in an economy, or the degree to which government regulations hamper economic activity or push it underground.[17] By recognizing entrepreneurship as the foundation for economic growth, the emphasis then must be turned toward those features of the economy that foster entrepreneurial activity. Surely research-and-development activity and investment in physical and human capital provide inputs that make growth possible, but by focusing on these inputs, contemporary mainstream growth models look past the process by which growth occurs. Research and development and investment do not cause economic growth, they take place in response to growth opportunities, and those opportunities are created by entrepreneurship.

Recent work that focuses on human capital as the engine of economic growth is just as misleading as the growth theory of decades ago that focused on physical capital investment as providing a "golden rule" for economic growth. Human capital is correlated with economic growth because a growing economy provides a greater return to human capital. The direction of causation is from an environment conducive to growth of human capital, not the other way around. This becomes apparent when entrepreneurship is viewed as the engine of economic growth. The existence of institutions conducive to entrepreneurship creates the profit opportunities which increase the return to education and lead to an increase in human capital. Human capital is important because it is a component of the production process, but entrepreneurship, not capital of any kind, is the underlying cause of growth.[18]

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[16]In an interesting bit of speculation, Weitzman (1996) argues that the former Soviet Union took neoclassical growth theory as the foundation for economic policy, and when their continual efforts at increasing output by increasing inputs into their production functions failed, the Soviet economy and government collapsed. The prediction of collapse goes back to Mises (1922), but the underlying faulty model to which Weitzman refers was not developed until decades later. It is interesting to conjecture that the Soviet Union may have collapsed because its leaders took neoclassical growth theory too seriously.

[17]de Soto (1989) presents a fascinating study of the way in which government restrictions have pushed a substantial fraction of Peru's economic activity into what he calls the informal sector of the economy, and the way in which this impedes economic development.

[18]Academic economists may have an incentive to overstate the importance of human capital because they receive their incomes from the production of education. If academics can convince

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CONCLUSION

The incorporation of entrepreneurship into the framework of economic growth contributes both to growth theory and to Kirzner's theory of entrepreneurship. Each framework helps enlighten the other. The growth framework furthers Kirzner's model of entrepreneurship by helping to illustrate where entrepreneurial opportunities originate, why more opportunities arise in some sectors of the economy than others, and what factors can provide incentives for entrepreneurs to more intensively search for new entrepreneurial insights. Entrepreneurial opportunities are not just exogenously delivered to an economy; in large part they are produced by entrepreneurial activities in the recent past. This expansion of Kirzner's framework explains the origins of entrepreneurial opportunities as well as the process of entrepreneurship.

Incorporating entrepreneurship into the framework of economic growth adds to growth theory by showing the nature of increasing returns to scale, knowledge externalities, and the role of human capital. These processes appear as a black box in mainstream growth theory, but when they are depicted as a part of the entrepreneurial process, it becomes apparent that the engine of economic growth is entrepreneurship, not technological advance or investment in human capital per se. This focus on entrepreneurship pushes growth theory in a direction that emphasizes the institutional setting within which growth occurs, and away from a neoclassical growth theory that focuses on inputs into the production process. The incorporation of entrepreneurship into the framework of economic growth not only fills in the institutional details to help make the growth process more understandable, but also points toward more promising economic policy recommendations for fostering economic growth.

In the latter half of the twentieth century a production function approach to economic growth has led both growth theory and growth policy to conclude that increases in output could best be produced by increasing the inputs into the production process. Policies were aimed at increasing both the quantity and quality of inputs through investment, incorporation of modern technology, and education. In many less-developed economies, the results have been disappointing. In contrast, this Austrian framework for viewing economic growth shows that the key element in economic growth is the production of entrepreneurial opportunities. When such opportunities are available, individuals have the incentive to invest in human and physical capital without government intervention. Mainstream growth theory has seen the problems with the mechanistic application of the production function approach to economic growth, but has responded by incorporating increasing returns and knowledge externalities into formal models in a way that obscures the way in which these factors might actually manifest themselves in the real world. The answer is the type of entrepreneurship that Kirzner described, and the straightforward prescription for economic growth is to create an institutional environment that encourages markets and rewards productive activity.

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the population at large of the importance of education, their incomes will rise. Thus, as Holcombe (1997) notes, one must be inherently suspicious of academics who argue the importance of education.

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A GEOGRAPHICAL PERSPECTIVE ON AUSTRIAN ECONOMICS

PIERRE DESROCHERS

> About a year ago I more or less suddenly realized that I have spent my whole professional life as an international economist thinking and writing about economic geography, without being aware of it.
>
> – Paul Krugman, *Geography and Trade*

> It has long amused high school philosophers that medieval theologians debated hotly about how many angels could stand on the head of a pin. It has only recently struck economists as strange, although not funny, that the bulk of economic theory assumes that all economic activities take place on the head of a pin. Given the capital equipment involved in most economic activities, compared to the harps and wings of angels, one would think that the pin-headed economic assumption the more ludicrous to maintain. Perhaps its greater longevity in economics says something about the relative realism involved in economics and theology.
>
> – Michael Bradfield, *Regional Economics*

It has long been recognized that in order to postulate strict laws and equilibrium, neoclassical economists have oversimplified their basic models to such an extent that they have, until very recently, almost entirely excluded processes relating to time and space. As economic geographers would have it, most economists have long inhabited a "spaceless wonderland" and have behaved as if the invisible hand was located on the head of a microscopic pin. Topics like the location of the various elements of an economic system, their connection and interaction in space or the spatial impact of economic processes, most certainly because they made basic assumptions like perfect competition untenable, were thus simply tossed aside and, it seems, in time unconsciously forgotten.

Despite the fact that they were not prisoners of these constraints, Austrian economists' treatment of geographical space has been rather limited, with perhaps the exception of Fetter's turn-of-the-century contribution to the theory of rent (Fetter 1977). Otherwise, one can find echoes of a distinct Austrian perspective on geographical space in the few comments Mises made on the important role that the limited convertibility of capital goods plays in human geography (Mises 1966, p. 513). Murray

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Rothbard wrote somewhat more extensively on the "economics of location and spatial relations" and on "interlocal exchange," but he followed the lead of traditional location theory by focusing almost exclusively on transportation and sunken costs. He wrote:

> [The distribution of people and business over the face of the earth] will differ from location to location in accordance with the distribution of natural resources and the distribution of capital equipment inherited from ancestors. Another factor influencing location will be positive or negative attachments to certain areas. . . . The actual dispersal over the face of the earth is caused chiefly by the distribution of productive land and natural resources over the earth's surface. This has been one of the chief forces limiting the concentration of industry, the size of each firm, and population in purely industrial areas. (Rothbard 1993, p. 551)

Hayek's classical argument on the importance of "particular circumstances of time and place" (Hayek 1948) could have opened the way to a different line of argumentation. By that now-famous phrase, he meant things such as the heterogeneity of capital goods (i.e., that some goods are tailored for the specific needs of a very small number of consumers) and the importance of non-material components to goods (such as ease of availability, quality of service, reputation of a supplier, etc.). Obviously, these circumstances will differ greatly from one location to another, but his treatment of the impact of geographical space on these circumstances remained rather casual.

To be sure, most economic geographers would not debate Hayek, Rothbard, and other Austrians' views on economic geography, but most of them would argue that there is much more to be said on this topic. Somewhat curiously though, they would be pointing toward the importance of local conditions on a number of issues that Austrians have been addressing for a long time, such as the diffusion of tacit knowledge, and importance of local conditions on economic coordination.

Once the sole province of economic geographers and regional scientists, regional growth and development theory has been supplemented in the last two decades by a number of new offerings, both theoretical and empirical, by business school professors, political scientists, economic sociologists and, lately, by some economists.[1] In the wake of the spontaneous and spectacular rise of some regions of the world (Silicon Valley, Third Italy, M4 Corridor, Orange County, Baden-Württemberg, etc.) and the decline of once-prominent manufacturing centers (some portions of the American Midwest, Wallonie, Lorraine, etc.) which could not be accounted for by the theories then available, a large number of scholars have begun taking a new look at the industrial and social characteristics of a given place (be it a city, a town, or a region) in providing (or not) fertile soil for economic development and technological innovation. The distinctive feature of most of these analyses has been the movement away from mechanistic and static "resources allocation" or "location scanning" perspectives

[1]The recent work of mainstream economists will not be discussed at length in this article, mainly because in the opinion of this writer (and of most regional scientists and economic geographers) most of it is not very original. Additional comments and references on that issue can be found in the conclusion of this article.

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towards more qualitative and dynamic analysis of technological change emphasizing the role of competition, cooperation, innovation, entrepreneurship, information diffusion, small business culture, flexibility, adaptability, and many other factors at the regional level. To put it somewhat succinctly, some places are said to be better than others at integrating the formal and informal collective processes essential to the production of permanent innovation. All participating agents profit from the advantages to be gained from being located in those special places, but the biggest benefits are said to be enjoyed by entrepreneurs and small firms who rely much more on their local economic environment than large, multi-plant corporations. The message emerging from this literature is two-fold: (1) where prosperity exists, it is regionally based; (2) the sources of this prosperity are to be found in the regions themselves and not in some exogenous factors.

This article is therefore intended as a complement to the Austrian tradition and will point out more specifically the importance of local conditions for the production of innovative goods and services. In doing so, it will borrow heavily from the main thrust of work in economic geography in the last decade, although it is not intended to be an exhaustive review of recent articles and current debates,[2] nor of the fate of planned science parks.[3] In fact, the views expressed in this article should not be taken as representative of those of the majority of economic geographers, for they depart from most of this literature on at least two counts. First, this author's views are not rooted in a belief that the "complex web of transactional relations" or the "network of synergy-producing interconnections" in a certain region—variously labeled industrial districts, innovative milieux, regional innovation systems, geographic industrial concentrations, technology districts, etc.—is an economic entity in its own right.[4] The purpose here is rather to illustrate how individuals living in the particular socio-economic environment of a region can have an economic advantage over other individuals living elsewhere. Second, it will be this author's purpose to illustrate that there is a body of economic geography theorems that are valid for all human action irrespective of time, something which is at odds with the "post-fordist"[5] theoretical framework now prevalent in economic geography.

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[2]There have been many reviews of this literature in recent years. See, among others, Courlet and Soulage (1995), Garofoli (1992), Hansen (1992), Maillat (1995), Saxenian (1994), Sternberg (1996), and Storper (1995).

[3]To put things briefly, most science parks which have attempted to replicate the processes that will be described in this article have been failures. See, among others, Côté (1991) and Massey et al. (1992) for a broader discussion of this topic.

[4]A number of authors have pointed out that the conceptual apparatus used in the last two decades has still not been clearly defined, still lacks operational feasibility, and has often led to analytical confusion (Sternberg 1996). Storper (1992, p. 85) has even written that these concepts are sometimes so vague that they can be cut "to fit any circumstance, and that no particular factor or combination thereof corresponds to the cases."

[5]In short, the fordist mode of production, consisting of the mass production of standardized outputs using single-purpose equipment, is allegedly being replaced by newer production systems more attuned to greater demands for quality and variety, relying mostly upon flexible machine tools, programmable multi-task production equipment, just-in-time deliveries, and greater worker responsibility for work organization and quality control (Piore and Sabel 1984). For a critical look at this thesis, see Williams et al. (1987) and Gertler (1992).

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TRADITIONAL ECONOMIC ANALYSIS OF GEOGRAPHICAL SPACE

Few economic phenomena can be considered ubiquitous. Somewhat paradoxically, one that qualifies best as a certainty, urbanization, has been virtually ignored by most economists. There is, however, a long tradition of spatial–economic analysis that can be traced back to some aspects of the work of classical economists (most notably Ricardo) and the German *Raumwirtschaft* tradition (featuring most notably the work of von Thünen and Weber), and that culminated in this century in the development of the fields of economic geography, regional science, and urban economics.[6] But to state matters briefly, until perhaps fifteen years ago the dominant approach toward geographical space was to view it as an abstract support for locational factors on which a purely exogenous "economic development" was equilibrating economies of agglomeration (centripetal forces) on the one hand, and diseconomies of agglomeration (centrifugal forces) on the other. Overall, these frameworks have mostly proven useful in explaining the locational behavior of consumer services and retail trade. Despite the completely static character of these schemes, some of the ideas used in those models are undoubtedly of great value, chief among which are "agglomeration economies," i.e., the benefits that derive from the spatial concentration of a certain number of firms. Agglomeration economies are of two types: those relating to the agglomeration of firms of the same industry in one area (localization economies), and those relating to the agglomeration of various industries in one location (urbanization economies).

Localization Economies

It has long been observed that most industries are not evenly distributed through space, but, rather, are usually highly concentrated in a few places. Thus, throughout history various cities have, at one point or another, been labeled "the capital of the world" in a highly specialized area of production. The universality of this phenomenon has long been established. For example, the Italian city of Sassuolo is famous for its ceramic tiles, Carpi for its woodworking machinery, Montebelluna for its ski boots, Arezzo for its jewelry, and Prato for its wool textiles. In Germany, Soligen has a long tradition in cutlery, Remscheid in toolmaking, Nuremberg in pen and pencils, Velbert in locksmith wares, Pforzheim in jewelry, etc. (Porter 1990).

Such geographical agglomerations of firms can be found at the city, neighborhood, or sometimes at the street level, usually depending on the capital requirements of each industry. Los Angeles's aeronautical firms are scattered throughout the city, whereas the firms involved in the specialized production of gems and jewelry in various metropolitan areas are usually packed close to the cores of their cities (Scott 1994). For example, in the middle of this century, the following trades were to be found within the confines of a few streets in Birmingham (England): goldsmiths, silversmiths, electroplaters, medalists, gilt and imitation jewelry fabrication, gem setting,

[6] On the relationships between economics and spatial analysis, see, among others, Hoover and Giarratani (1984), Dicken and Lloyd (1990), Coffey (1992), Mills and Hamilton (1994), Milne (1993), Feldman and Florida (1994), Scotchmer and Thisse (1994), and Hansen (1995). There are at least three theoretical traditions in spatial analysis, all of which are discussed at length in the classic textbook in economic geography (Dicken and Lloyd 1990): the neoclassical, the behavioral–organizational, and the structuro–marxist.

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stamping and piercing, engraving, polishing and enameling, die sinkers, jewelry repair, refiners, general outwork, factors and merchants, dealers in bullion and precious stones, jewelers' material suppliers, manufacturers of optical goods, watchmakers, and miscellaneous manufacturers (Wise 1949).

Vertical disintegration is known to be positively associated with geographical agglomeration. Typically, apart from highly capital-intensive industries (steel, petrochemical, etc.), these dense agglomerations are usually made up for the most part of a huge collection of small firms from the same or closely interconnected branch of industry employing only a handful of workers, though often enough large producers are found in them. Thus, more than 60 percent of the firms in Birmingham's jewelry district had ten employees or fewer, and all were bound together in a dense structure of transactional interrelations. Closer to us, before mini-computers ran into trouble in the late 1980s, more than 70 percent of software firms along Boston's Route 128 employed fewer than 25 people, and more than 60 percent of manufacturing companies in that area employed fewer than fifty (Rosegrant and Lampe 1992, p. 27).

What are the advantages of a cluster of apparently redundant small firms over the economies of scale that a single large firm should bring? It mainly has to do with permanent innovation, flexibility, and sudden shifts in market demand. In short, the real economy is a turbulent, uncertain and highly dynamic phenomenon. Silicon Valley's *Sun Microsystems* will provide an illustration.[7]

> While specialization is often an economic necessity for start-ups, Sun did not abandon this strategy [of outsourcing] even as the firm grew into a multi-billion dollar company. Why, asked Sun's Vice President of Manufacturing Jim Bean in the late 1980s, should Sun vertically integrate when hundreds of Silicon Valley companies invest heavily in staying at the leading edge in the design and manufacture of integrated circuits, disk drives, and most other computer components and subsystems? Relying on outside suppliers greatly reduced Sun's overhead, while ensuring that the firm's workstations contained state-of-the-art hardware.
>
> This focus also allowed Sun to introduce complex new products rapidly and to alter their product mix continuously. According to Bean: "If we were making a stable set of products, I could make a solid case for vertical integration." Relying on external suppliers allowed Sun to introduce an unprecedented four major new product generations during its first five years of operations, and to double the price-performance ratio each successive year. Sun eluded clone-makers through its sheer pace of new product introduction. By the time a competitor could reverse-engineer a Sun workstation and develop manufacturing capability to imitate it, Sun had introduced a successive generation. (Saxenian 1990, pp. 5–6)

Although Silicon Valley is a recent phenomenon, the geographical clustering of small firms is in no way new, and tales similar to Sun's can be found in various

[7]There will be a number of references to Silicon Valley in this article, but similar answers are obtained in all unplanned geographically localized industries (whether in manufacturing, financial services, entertainment, etc.). The emphasis on Silicon Valley is used mainly to illustrate that even in the industries most likely to use sophisticated means of communication, physical proximity still has some important benefits.

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historical records. Indeed, many people noticed the phenomenon long ago and began positing various explanations for it.[8] The most well-known classical treatment of this question is Alfred Marshall's succinct characterization of "industrial districts."[9] Although Marshall apparently first noticed the phenomenon by looking at the cutlery industry of Sheffield and the cotton weaving industry of Lancashire, he noted that "indications of a like stage of things are found in the histories of oriental civilizations and in the chronicles of medieval Europe." He thus referred to a book written in about 1250 which noted such specialized production of scarlet at Lincoln; blankets at Bligh; burnet at Beverley; russet at Colchester; linen fabrics at Shaftesbury, Lewes, and Aylsham; cord at Warwick and Bridport; knives at Marstead; needles at Wilton; razors at Leicester; soap at Coventry; horse girths at Doncaster; skins and furs at Chester and Shrewsbury; and so on (Marshall 1986, p. 223). From these observations, he would derive his notion of "external economies of scale" to refer to the sources of a productivity increase that lie outside of the individual firm. As he put it:

> the economic use of expensive machinery can sometimes be attained in a very high degree in a district in which there is a large aggregate production of the same kind, even though no individual capital employed in the trade be very large. For subsidiary industries devoting themselves each to one small branch of the process of production, and working it for a great many of their neighbors, are able to keep in constant use machinery of the most highly specialized character, and to make it pay its expenses, though its original cost may have been high, and its rate of depreciation very rapid. (Marshall 1986, p. 225)

In Marshall's view, producers derive external benefits by sharing the fixed costs of such common resources as specialized infrastructure and services[10]; skilled labor pools[11] and specialized suppliers; and a common knowledge base. Although in the

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[8]Classical articles on this topic are F.S. Hall's Census monograph, "The Localization of Industries" (U.S. Census of 1900, *Manufactures*, part 1, pp. cxc–ccxiv); chapter 5 of A. Weber's 1909 *Theory of the Location of Industries*; and A.P. Usher's note on the location of industries in the 1912 U.S. Census of Manufactures. A classic analysis of the clustering of certain manufacturing industries on the basis of agglomeration economies external to the individual firm is Lichtenberg's (1960) study of the New York metropolitan region in which he identified eighty-seven industries dominated by external-economy factors of location. For a more colorful description of geographically concentrated industries, one can also look at some of the earliest articles (1937) of a young free-lance journalist, Jane Butzner —who would later marry an architect by the name of Robert Jacobs—on the flower and diamond districts of New York City. These articles were recently reprinted in Allen (1997).

[9]Marshall's characterization of industrial districts reportedly appeared in the first edition of his *Principles* in 1890 (see chapter 10, book 4 of his *Principles of Economics*, 8th ed., 1920, for the quotations used here).

[10]For example, various firms in the petro-chemical industry will cluster their installations to save on the cost of pipelines, oil ports, etc.

[11]Marshall (1986, pp. 225–26) noted that this benefited both the workers and the employers:

> Employers are apt to resort to any place where they are likely to find a good choice of workers with the special skill which they require; while men seeking employment naturally go to places where there are many employers who need such skills as theirs and where therefore it is likely to find a good market. The owner of an isolated factory, even if he has good access to a plentiful supply of general labor, is often put to great shifts for want of some special skilled labor; and a skilled workman, when thrown out of employment in it, has no easy refuge. Social forces

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following decades many districts faded away with the obsolescence of their production, or through mergers,[12] or deliberate state planning,[13] most of them proved remarkably resilient and new ones kept appearing spontaneously. In Italy, the phenomenon became so widespread by the mid-1970s that it prompted some local sociologists and economists to resurrect Marshall's analysis. In Switzerland, the painful but quick adaptation of the local watch districts, following the serious setback brought about by the introduction of Japanese digital watches, also prompted a closely related literature. In the United States, high-technology analysts witnessing the spectacular rise of Boston's Route 128, California's Silicon Valley, and Orange County realized that, contrary to popular belief, agglomerative tendencies were not vanishing, and that the more "high-tech" an industry was labeled, the more likely it was to be geographically localized. As more scholars became involved in this research agenda, thousands of geographically concentrated industries were "discovered" the world over, from Thailand to France, Denmark to Japan, and Mexico to Portugal (Courlet and Soulage 1995; Garofoli 1992; Hansen 1992; Maillat 1995; Saxenian 1994; Sternberg 1996; Storper 1995). It has also been noted that metropolises are typically patchworks of industrial districts. Thus New York has, among others, its garment, financial, diamond, and advertising districts, while Los Angeles has its film and TV, clothing, furniture, and jewel manufacturing districts (Scott 1988).

Urbanization Economies

Although most cities are usually specialized in a few lines of work, they are also the hosts to many other activities supplying the most ordinary to the most prestigious piece of equipment or services to a whole range of industries. The spatial agglomeration of various activities will, for example, allow the operation of airports, hospitals or cultural activities, as well as law, accounting, and various consulting firms of the first order. The recent "core competencies" and "just-in-time" strategies of many firms has also reminded us of the benefits of a greater division of labor between firms in close geographical proximity to one another. It thus obviously makes sense for any business to externalize a function that can be done more effectively by a specialized external firm, but there are also many advantages for a subcontractor serving firms in a wide range of industries to be located close to its customers, both in terms of reducing transaction costs and increasing speed of delivery (i.e., by making daily deliveries, saving the buyer warehousing space, reducing the risk of running out of a needed item while it is being shipped from a long distance, etc.).

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here co-operate with economic: there are often strong friendships between employers and employed: but neither side likes to feel that in case of any disagreeable incident happening between them, they must go on rubbing against one another: both sides like to be able easily to break off old associations should they become irksome. These difficulties are still a great obstacle to the success of any business in which special skill is needed, but which is not in the neighborhood of others like it.

[12]Thus, Detroit's auto industry before Henry Ford and Alfred Sloan, was made up of a huge number of small firms.

[13]The silk and textile district of Lyon thus fell victim in the 1960s to the French state's campaign of economic modernization (i.e., unilateral mergers), whereas the gun district of Birmingham (U.K.) was dealt a major blow by state encouragement of mass-production in non-central areas.

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On the Persistence of Agglomeration Economies

Agglomeration economies have existed from time immemorial, but non-specialists typically assume that they are something on the verge of collapse. Alfred Marshall thus wrongly believed, like many earlier and later popular writers and scholars, that production on a large scale and the fall of transportation costs of both knowledge and people—which he associated in his time mostly with the railway and the telegraph—would deal a major blow to geographic concentration. Like other prophets of the end of economic geography, however, he was proven wrong. The same can be said for the advanced telecommunication systems of recent years that show no signs of wiping out geographically concentrated industries and cities. The efficient allocation of resources over geographical space plays an obvious role in shaping the economic landscape of our world, but it cannot be the whole story behind the persistence of the geographic concentration of economic activity. What is it then? As a number of writers have pointed out, one must look at the importance of geographical proximity for innovation.

ON THE ADVANTAGES OF GEOGRAPHIC CONCENTRATION

To understand the persistence of geographical clusters of innovative firms, we first need to return to Marshallian analysis. As we have seen, Marshall identified the importance of a common knowledge base as the third major force behind agglomerative trends. As he put it:

> When an industry has thus chosen a locality for itself, it is likely to stay there long: so great are the advantages which people following the same skilled trade get from near neighborhood to one another. The mysteries of the trade become no mystery; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas. (Marshall 1986, p. 225)

In short, Marshall rightly pointed out that people of related trades gather close to each other because geographical proximity increases the concentration of tacit knowledge and the speed of information flows. As Austrians have long pointed out, innovation is all about continuous learning. The crucial knowledge in an industry is not standardized information, routine patterns, or even the public knowledge of science. The important knowledge is uncodified and is not available in any formalized mode of communication. It is what is new, what are the latest changes, and what is the specialized know-how that individuals have acquired through practice and mistakes. To compete effectively in many industries, it is not enough to look at trade journals or computer screens, to communicate via telephone conferences, or to monitor plants in remote locations via modern communication means. Being where your partners and competitors are is an important asset. Socializing with them allows the opportunity to ask for advice or for a specific bit of information, but it can also lead to unexpected benefits. Informal encounters where one person says to a second, "What are you working on?" and where a third jumps in and adds "I know somebody you've got to talk to; I'll call you with the number" are often very fruitful. Although exchanges of this kind might last less

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than two minutes, they may prove to be the most productive encounter of the entire day for everybody involved. It was true in Marshall's time and earlier. It is still true in today's geographical clusters of innovative firms.

According to Saxenian, it is not simply the concentration of skilled labor, suppliers, and information that distinguish Silicon Valley, but the dynamics of its social networks.

> A variety of regional institutions—including Stanford University, several trade associations and local business organizations, and a myriad of specialized consulting, market research, public relations and venture capital firms—provide technical, financial, and networking services which the region's enterprises often cannot afford individually. These networks defy sectoral barriers: individuals move easily from semiconductor to disk drive firms or from computer to network makers. They move from established firms to start-ups (or vice versa) and even to market research or consulting firms, and from consulting firms back into start-ups. And they continue to meet at trade shows, industry conferences, and the scores of seminars, talks, and social activities organized by local business organizations and trade associations. In these forums, relationships are easily formed and maintained, technical and market information is exchanged, business contacts are established, and new enterprises are conceived. . . . This decentralized and fluid environment also promotes the diffusion of intangible technological capabilities and understandings. (1990, pp. 96–97)

Some authors studying less dynamic firms in stagnant regions have, however, downplayed the role played by social networks in local environments and have stressed that most small firm owners and managers tend to be individualistic and too busy to engage in constant networking (Rallet 1993; Julien et al. 1994; Joyal 1996). Be that as it may, geographical proximity in an urban setting has some undeniable advantages for those individuals who are willing to use them, namely timeliness in getting or delivering something and the opportunity of frequent face-to-face communication. Often enough, if most economic actors do not realize the importance of physical proximity when they first go into business, it later becomes apparent to them, through trial-and-error, that it is an important asset in any innovative business venture.

We shall now look in more detail at the advantages of geographic concentration on the transmission of tacit knowledge, human cooperation, and entrepreneurship.

Geographical Proximity and the Diffusion of Tacit Knowledge

The main argument in favor of the importance of physical proximity for the transmission of tacit knowledge is that deconcentration cannot be accomplished easily for activities dealing with creative work, mainly because long-distance communication is still inadequate for the continuous and detailed engineering or technical adjustments that are needed in the course of technological creation. Technology transfer typically involves specialized knowledge and is thus a personal interaction process. Information systems and data bases are enabling tools, but successful technology transfers still require the personal contact with the persons possessing effective know-how. It has also been pointed out that local distributors and representatives are usually considered poor alternatives to the actual producers (Gertler 1995).

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Following von Hippel (1988), we can assume a situation in which a firm's staff of engineers has to develop a new product (exchanges of technical information take place frequently between firms, but it is not possible to apprehend the magnitude of these activities in financial or statistical terms). When required know-how is not available in-house, it is often not in publications either. It either does not exist or is only in the minds of other technical people. Since in-house development is always time-consuming and expensive, there is often a high incentive to seek the needed information from people working in other firms. And although engineers and technologists have met other technical people at various meetings, trade shows and conferences, they are more likely to be acquainted with and ask for help in the staff of nearby firms, if only because it is more convenient.

von Hippel has described this process, but in an a-spatial context, in this way:

> The informal proprietary know-how trading behavior I have observed to date can be characterized as an informal trading network that develops between engineers having common professional interests. In general, such trading networks appear to be formed and refined as engineers get to know each other. . . . In the course of such contacts, an engineer builds his personal informal list of possibly useful expert contacts by making private judgments as to the areas of expertise and abilities of those he meets. Later, when Engineer *A* encounters a difficult product or process development problem, *A* activates his network by calling Engineer *B*—an appropriately knowledgeable contact who works at a competing (or non-competing) firm—for advice. Engineer *B* makes a judgment as to the competitive value of the information *A* is requesting. If the information seems to him vital to his own firm's competitive position, *B* will not provide it. However, if it seems useful but not crucial—and if *A* seems to be a potentially useful and appropriately knowledgeable expert who may be of future value to *B*—then *B* will answer the request as well as he can and/or refer *A* to other experts. (von Hippel 1988, p. 77)

The importance of physical proximity in producer–user relations is also well documented. Considering the fact that in many industries, users, and not manufacturers, create most innovations (von Hippel 1988; Slaughter 1993),[14] this point seems indeed most relevant and explains why, historically, physical proximity between the producer and user of machinery seems to have been indispensable. In short, as Rosenberg (1970, p. 570) noted almost three decades ago, successful instances of technological change typically involve

> a direct confrontation between the user of a machine, who appreciates problems in connection with its use, and the producer of machinery, who is thoroughly versed in problems of machinery production and who is alert to possibilities of reducing machinery (and therefore capital) costs.

To quote the down-to-earth language of a Silicon Valley president:

> I don't care how well the specifications are written on paper, they are always subject to misinterpretation. The only way to solve this is to have the customer's engineers right here. There is no good way to do it if you are more than fifty miles away. (Saxenian 1990, p. 17)

[14] Kealey (1996) reminds us that this is a point Adam Smith made in the *Wealth of Nations*.

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In reporting the results of a survey of users of advanced manufacturing technologies in southern Ontario, Gertler (1995, p. 16) wrote that his interviews revealed an

> emphatic and widespread agreement that site visits between user and producer—ideally throughout the entire acquisition [of a new technological] process—were absolutely crucial for ultimate success when the technology was new, complex, and expensive.

Typically, face-to-face contact was deemed especially important during the installation and initial operation of a newly acquired technology. But actually, the importance of face-to-face communication went beyond the effective exchange of information. It was also judged extremely useful in delivering training to the user's technical and operative personnel. As he put it, printed manuals were often considered "next to useless" and videotapes were regarded as poor substitutes to "being there." Gertler also mentioned the following anecdote to illustrate implementation difficulties resulting from geographical distance.

> One [Ontario] medium-sized manufacturer of plastic products described how a service person for a machinery producer in Ohio failed repeatedly to solve the user's technical problem despite repeated contact via telephone and fax. In frustration, the producer finally "sent a box of parts" by courier for the user to try. This strategy too was unsuccessful. After the user had incurred considerable expense and delay, the service person finally paid a site visit to the user's plant, whereupon the problem was solved "in about five minutes." (Gertler 1995, p. 11)

This author has also alluded to the difficulties faced by European producers in serving the North American market directly from Europe or through American distributors. Some evidence thus indicates that, unless the information transmitted is relatively standardized, new telecommunications technologies still cannot be substituted adequately for face-to-face contact.

The conventionally held view that telecommunications technology will produce a decentralization of economic production is, as we have seen, a very old one. But history tells us otherwise, as typically better communication technologies are associated with a higher geographical concentration of decisionmaking centers and highly specialized productions of goods and services, while only the most standardized operations usually become truly footloose. And although, under particular circumstances, some people might like to work from their home offices, in the end it is probably true that most humans are really social animals who like to be with other humans.

Geographic Proximity and Human Cooperation

Human cooperation is, of course, nothing new to Austrian economists (Mises 1966, p. 143). But cooperation of the type mentioned before is not always easily done, for the most important question is always: "Can I trust this guy?", something which is still impossible to establish over a telephone or a computer. Lack of full trust or a sense of insecurity typically implies some concealment of information or the expensive hiring of attorneys. Geographical proximity, because of the frequent interactions and long-term contracts or commitments between people that it allows (whether in working environments or in social activities), often plays a crucial role in

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building the trust bonds that are needed in this process or in a successful customer–supplier relationship. As a Silicon Valley CEO put it:

> We've never been successful for any length of time outside of a local area. We might get a contract initially, but the relationship erodes without constant interaction. Sophisticated customers know that you must be close because these relationships can't be built over long distances. (Saxenian 1990, p. 22)

Many authors have, however, pointed out that regions dominated by large firms or branch plants, as well as almost all scientific parks, are less likely to develop cooperative behaviors than others in which the industrial structure is predominantly made up of small- and medium-sized businesses who need to get most of their inputs from their region (Piore and Sabel 1984; Hansen 1992).

Geographical Proximity and Entrepreneurship

Another area where the recent economic geography literature differs markedly from older offerings is in the focus now being put on entrepreneurship, but more specifically on "spin-offs" or "start-ups." Following Côté (1991), we can describe a typical situation. While employed, a dynamic worker acquires specialized knowledge and credibility in a particular line of business. He gets to know a number of workers who also possess specialized know-how in production, management, marketing, finance, and so on. He learns about the marketplace and about the features and weaknesses of products that sell. He also gets to know who matters in the industry, the important clients, the key distributors, the potential mentors. He learns about marketing practices and techniques, upcoming developments, and so on. Although he has seen reports on TV about great entrepreneurs, it is the successes of a former co-worker or of an acquaintance in his neighborhood that has made him realize that he too could make it on his own.

Then one day, this salaried worker sees an opportunity in the marketplace, a fragment of work in which his current employer is not interested. Leaving the security of a salaried job, however, is not an easy decision. The potential entrepreneur recognizes that he is taking a risk with his money, his future, and that the opportunity that he wants to seize must be developed as quickly as possible in order to achieve a good position in the market. Finding competent employees quickly, various inputs at an affordable price, potential buyers, and maybe an investor who believes in him weighs heavily in his decision to launch or not launch his business. It is at this junction that agglomeration economies are often the key. Their importance is highlighted by the fact that most "spin-offs" always tend to be located close to their former employers. Thus, to take a typical example, the highly successful medical equipment industry of Minneapolis–St. Paul can in many ways be traced back to *Medtronics*, whose spin-offs include, or have included: *Cardiac Pacemakers Inc., Renal Systems, Stimulation Technology, EMPI, Aequitron Medical, Med Tel, Medical Devices Inc., Pharmadyne Corp., Vivatron Inc., WR Medical Electronics Company, Population Research, Angiocor, Biomedicus Inc., Sci Med Life Systems,* and *Mentor* (Miller and Côté 1987, p. 92). As one might expect, it has also been pointed out that cooperation with the parent company is often secured if the new product is different from that produced in the mother enterprise and that spin-off activities not only lead to the exploitation of product niches, but also to an intensive interplay among local firms (Hansen 1992).

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THE PROBLEM WITH RECENT RECONCEPTUALIZATIONS

If it is well known that people in organizations continually absorb new technologies (by buying them from external suppliers, inventing their own, or doing some of both) and that they also diffuse their own in numerous ways (by employees changing jobs, client-supplier relations, sponsor relations, incubation of entrepreneurs, etc.), it seems fair to say that local conditions often play a crucial, if neglected, role in this process. Although a large number of reconceptualizations have done a lot to point out the importance of local conditions, in the opinion of this writer most of these contributions do exhibit a major flaw. It is that, although their main goal is to explain the impact of local conditions on technological innovation, the analyses offered typically focus on highly specialized districts or holistic concepts. They implicitly ignore the most fundamental aspect of any type of creative process, which is that innovation typically proceeds by combining heterogeneous facts, ideas, faculties, and skills.

As a design engineer has put it: "[the main thrust of an engineer is] to gather knowledge from diverse places in order to help solve technical problems" (Fores 1979, p. 853). This obviously has happened countless times in the past. Practical metallurgy thus began with the making of necklace beads and ornaments in hammered native copper long before knives and weapons were made. Ceramics began with the fire-hardening of fertility figurines molded of clay. Rotary motion was first used in the drilling and shaping of necklace beads, and it is most likely that the playful rolling of beads strung upon a wire is an antecedent to the idea of a pair of wheels turning purposefully on the axle of a cart or carriage, and so on (Smith 1982). There is actually plenty of evidence, both quantitative and qualitative, showing the importance of the diffusion of technical knowledge between industries (Glaeser et al. 1992; Desrochers 1996; Feldman and Audrestch 1997).

If there are reasons to believe that small- and medium-sized firms get most of their technological inputs from their region's industrial base, there are also many reasons to believe that they do not limit themselves to one industrial fragment of it. This is a point that the urban theorist Jane Jacobs addressed more than twenty-five years ago (Jacobs 1969). In short, her argument is based on the contention that the spatial concentration of large groups of people permits a great deal of personal interaction, which in turn generates new ideas, products, and processes. Although her argument on the importance of local conditions for the cross-fertilization of ideas and techniques is often sketchy, it proved to have remarkable insight.[15] It was also in many ways a forerunner of the current qualitative work now being done in economic geography, although, following Lucas's endorsement (Lucas 1988), it mostly drew the attention of scholars with a more quantitative frame of mind. Some of them have presented evidence pointing toward the greater importance of industrial diversity on local job creation in both American (Glaeser et al. 1992) and Canadian cities (Coffey and Shearmur 1996), while others have used data on new product announcements at the city level to conclude that the presence of diverse industries within the same science-base in a city appears to lead to increased innovation (Feldman and

[15]This article can thus be interpreted as an attempt to clarify and elaborate on Jacobs's work.

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Audretsch 1997). However, quantitative analysis cannot properly address the impact of local conditions on the cross-fertilization of knowledge, and only by looking closely at the actions of individuals will we gain any real insights into the processes at work (Desrochers 1996).

Gutenberg's invention of the printing press will afford a first illustration. In many ways, this story helps us to understand why historically most inventions have been made in cities, and why the combination of agglomeration economies and of various people interacting together indeed seems to be a major factor in technological creation. At the dawn of the fifteenth century, printing was no longer a novelty in Europe. Printing from wooden blocks on vellum, silk, and cloth apparently started in the twelfth century, and printing on paper was widely practiced in the second half of the fourteenth. Oddly enough, though, the starting point of Gutenberg's invention was playing-cards on which a few words had been printed by way of rubbing wood-blocks on a sheet of paper. As he wrote in his correspondence to a clergyman:

> Well, what has been done for a few words, for a few lines, I must succeed in doing for large pages of writing, for large leaves covered entirely on both sides, for whole books, for the first of all books, the Bible. How? It is useless to think of engraving on pieces of wood the whole thirteen hundred pages. . . . What am I to do? I do not know: but I know what I want to do: I wish to manifold the Bible, I wish to have the copy ready for the pilgrimage to Aix-la-Chapelle. (Koestler 1969, p. 122)

Gutenberg then searched for a device more resistant than wood-block, which lead him to notice the seals used to authenticate documents, but rubbing them on paper did not give a clear print. He found the solution one day, while attending a wine harvest near his city.

> I took part in the wine harvest. I watched the wine flowing, and going back from the effect to the cause, I studied the power of this press which nothing can resist. . . . God has revealed to me the secret that I demanded of Him. . . . One must strike, cast, make a form like the seal of your community; a mold such as that used for casting your pewter cups; letters in relief like those on your coins, and the punch for producing them like the foot when it multiplies its print. There is the Bible! (Koestler 1969, pp. 123–24)

Closer to us is Stan Mason, a prolific inventor who has made innovations in a wide range of industries.[16] Mason has frequently claimed that he doesn't know a thing about a lot of things, but that he does keep a very thick Rolodex. According to one reporter, "for most projects, Mason calls in three or so outside experts to noodle the problem, usually without each other's knowledge [and then] picks the best solution" (Cyr 1997, p. 47). Being based in the Connecticut extension of the New York City metropolitan area gives Mason the opportunity to easily access the tacit knowledge of a large number of experts, and clearly this seems to have been an asset in his case. Similarly, Petroski (1994, p. 35) describes the extraordinary ingenuity of

[16] A man who, among other things, perfected the stringless Band-Aid package, the squeezable ketchup bottle, wilt-proof microwave cookware, placenta bins, double-sided acne pads, and plastic underwire supports for bras. His clients have ranged from medical entrepreneurs to Pepsico. In inventing across industries, this inventor reflects the rule rather than the exception.

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Jacob Rabinow,[17] a man who lived almost all of his life in the bustling industrial and commercial diversity of New York City. His creativity was greatly enhanced by living in a city where he had contact with a variety of people and their wide range of technical problems. Rabinow was able to apply the knowledge he gathered to a broader range of problems than if he had lived in a less diverse environment.

Another classical type of intersectoral diffusion is that many technology transfers between industries actually take place as a result of firms adding to, or switching, their product lines. This typically happens when individuals in a firm have developed a new technique in response to a particular problem in one industry and when it later becomes apparent that this technique, or the know-how associated with it, is applicable in another industry. This is a process that defies the economists' notion of products or well-defined industries.[18] While trying to match patent classification and SIC classification for further statistical analysis, Schmookler (1966, p. 23) made some interesting comments on this issue.

> [A major] deficiency arose from the fact that I could not assign many [patented] inventions to a single industry. In part this resulted from my own ignorance, but often it reflected the interindustry character of technology. Thus, a given improvement in the diesel engine may be used in generating electricity or driving a locomotive, a given bearing may be used in a shoemaking machine or a lawn mower, and a given knife may be used in harvesting or in kitchens. In consequence, the patent statistics used below generally do not include power plant inventions, electric motors, bearings, or other instruments or materials whose industry of origin was either multiple or simply not evident. Unfortunately, this means that the railroad data do not include inventions in the field of the steam or diesel engines, and that neither the farm nor the construction data include inventions on tractors.

This phenomenon is well documented, but to this writer's knowledge, nobody has specifically looked at the impact of local conditions on this process. Although this was not the primary focus of their study, researchers have recently begun addressing this issue in some detail in the context of the skills acquired by various Montréal firms in developing new materials and technologies for a magnetic fusion facility (Trépanier and Bataïni 1995). Thus sometimes the specific technology, but more typically the know-how that was developed in providing new components and apparatus for this particular facility, has been reused in fourteen other domains such as telecommunication, aerospace, and electronics industries. In most cases, geographical proximity was deemed crucial in the development of new technologies by providing a setting for frequent face-to-face communication between people working in various industries and in the magnetic fusion center itself and, in a later stage, by providing either local customers or a network of various technical people on which the firms could rely were they to run into particular problems in selling and implementing their new expertise outside of Montréal's metropolitan area.

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[17] Born Jacob Rabinovich, he produced a huge number of inventions ranging from self-regulators for watches and clocks to the automatic letter-sorting machines used by the Postal Service.

[18] As the prominent mainstream economist Zvi Griliches has put it, the idea of a well-defined industry "may be a mirage anyway" (Griliches 1990, p. 1666).

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After a reasonably diligent search (Desrochers 1996), I think that we can identify five frequent modes of intersectoral diffusion, although it is true that they are only variations of the combined problem-solving process involved in any creative act. Some of them occur in the diffusion of products or processes: (1) an individual working alone or for a firm[19] sells his new product or process to firms from various industrial sectors; (2) a product or process already sold to firms in many industries is improved in a specific manner, and this improvement in the product or process then benefits all the previous customers. Others occur in the production of products or processes: (a) individuals working for two or more firms from various industries collaborate to develop a new product or process; (b) a product or a process already used in one industry is noticed and picked up by an individual working in another industry, with or without the collaboration of individuals working in the industry of origin; (3) an entrepreneur/manager hires workers from another sector so that they can apply their knowledge to a new production. If there are still no detailed studies of the impact of local conditions on these processes, it seems fair to postulate that the phenomena described earlier will probably play the same role here.

Without getting into the specifics of each of these modes of diffusion, the following example will provide an illustration of these processes. In the 1980s, aerospace manufacturers began using carbon composite material instead of aluminum to make tail sections, wings, noses, and fuselages. Used first in tennis rackets and skis, composite material is just as strong but typically only weighs about half as much as aluminum. But it is also far more expensive and much more difficult to handle because if the composite material is not kept refrigerated before being cut to the proper shape, the material will be wasted. Properly refrigerating a huge aircraft while in production, however, was no simple task. When production managers at *Northrop* began wrestling with this practical dilemma, one of them decided to call up the refrigeration specialists at *Sara Lee*. Not long after that, knowledge and expertise gathered through decades of refrigerating large facilities became part of modern aircraft production technology (Rothschild 1990, p. 128).

Examples of this type abound, either in historical records, technical magazines, or newspapers, but although the reasons for these transfers are intuitively well understood, their timing and the circumstances that are conducive to them are still not very well documented, probably because they usually don't leave any of the "paper trails" which social scientists are used to following. Nevertheless, they appear to be an important determinant of technological progress. One may hope that they will generate more interest on the part of students of regional growth in years to come. The final words here belong to scientist/entrepreneur/manager turned academician Ralph Landau.

> Once, in a philosophical discussion with a representative from my corporate partner . . . we examined why our relatively small research organization consistently seemed to produce extraordinary results when many other similar organizations in large companies did not, despite the obvious advantages they were offered. We attributed it in part to the fact that we had employees who lived close to the large metropolitan center of New York and who were intimately involved with global problems through the participation of the entire organization in world affairs. This gave them an extremely cosmopolitan perspective.

[19]There can, of course, be more than one individual involved.

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> In private life, these people enjoyed many of the features that only a large city can offer. In fact, the kind of person who is attracted to New York is very often the kind who would not fit into the culture of a large company. For New York one can substitute few other major cities in the United States. Nevertheless, research organizations are often located on predominantly semi-rural or rural campuses where it is supposed that people can think more effectively. I have often felt that this is not always so and that the research environment for an industrial organization requires a feeling of intense energy—even pressure—and the knowledge that there are important problems that must be solved every day. (Landau 1996, p. 2)

CONCLUSION

Economic geography as an area of inquiry has enjoyed tremendous popularity in recent years, as it moved from essentially the two sides of location theory—the cost-oriented analysis of optimum plant location and the demand-oriented analysis of sales areas—to more qualitative analysis of networks of firms and the regional systems they generate. The main message emerging from the new literature is that if geography is not always a necessary condition for innovation, some environments are more likely than others to bring forth a stream of innovations. There are still, however, a number of problems with recent contributions and thus a number of reasons to believe that an Austrian perspective on regional analysis could add much to the study of these questions.

Somewhat paradoxically, the new popularity of economic geography has not so much been the outcome of economic geographers and regional scientists somehow being able to market their work to a larger audience, but rather the result of a number of outsiders to the discipline who have stressed the importance of geographical space to an audience unfamiliar with these issues, often enough making a name for themselves in the process or confirming their reputation as "authentic visionaries." Thus, few people paid attention to the "Third Italy" phenomenon before Michael Piore and Charles Sabel presented the work of Italian scholars to the world in their 1984 bestseller, *The Second Industrial Divide*. Clusters of innovative firms were "discovered" by many people through Harvard Business School's Michael Porter in his 1990 *Competitive Advantage of Nations*. Lately, business guru Kenichi Ohmae (1995) has been praised by one *Wall Street Journal* reviewer for advancing the "provocative thesis" that nation-states are dinosaurs waiting to die and that there are mysterious creatures, region states, each inhabited by five to twenty million people, that have somehow emerged as real natural units. By and large, these works have been welcomed by economic geographers and regional scientists as interesting additions to their own work.

The same can probably not be said about the work emanating from more mainstream economists who began "discovering" geography at the turn of the decade, mostly through the work of Paul Krugman (1991). Thus, the reviewer in the *Southern Economic Journal* obviously had a vocabulary problem when describing his admiration for Krugman's "meaty ideas" such as his insight of bringing "Alfred Marshall up to date" and for making the important observation that "most localizations are not high-tech" (Khalil 1992). In what has now become a typical disclaimer, prominent mainstream economists have recently written: "The second set [of theories of international trade patterns] interacts increasing returns with transport costs to

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create what Krugman . . . has dubbed models of "economic geography" (Davis and Weinstein 1996).

The point here is not to express the frustrations of geographers and regional scientists with the recent work of mainstream economists,[20] something which has been done in much detail elsewhere (Martin and Sunley 1996; Hansen 1995), but rather to underline the fact that many economists, from the neoclassical mainstream to the various neo-institutionalist subdivisions, have admitted the value of a geographical perspective to our understanding of a market economy. Only Austrians as a group seem to have been spared the "geography fever" of recent years, although Austrian economics has recently been making some headway in regional analysis (Kirat 1993; Hite 1995). It is to be hoped that this article will have convinced some long-time Austrian scholars of the importance of a geographical perspective to our understanding of market processes, and that before long regional analysis will benefit from their unique perspective.

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[20] Altough a comment is probably worth making here. The most prominent mainstream economists involved in the "new regional economics" are also regulars of the trendiest academic think tank, the Santa Fe Institute, where they closely interact with luminaries of diverse fields (physics, cognitive psychology, computer science, etc.) (Waldrop 1993 [1992]). As might be expected, their work shows tremendous cross-fertilization of ideas from these other fields, yet some of them, such as Brian Arthur (1990) and Paul Krugman (1991), cling to the view that the regional specialization of industries is somehow the most efficient form of spatial organization. One of the few exceptions in that group is Jose Scheinkman (Glaeser et al., 1992). This probably shows that there is nothing mechanical about the cross-fertilization of ideas, and that any attempts at formalizing this phenomenon as if it was somewhat automatic is probably misguided.

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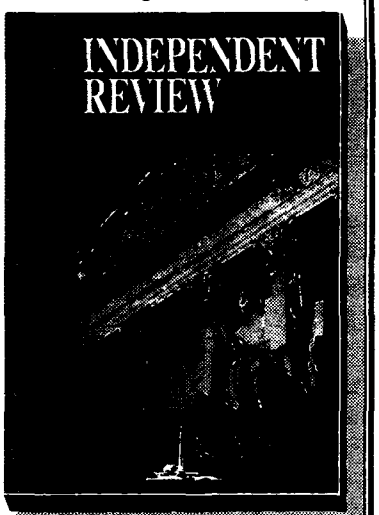

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THE RECESSION OF 1990: A COMMENT

PAUL CWIK

Arthur Hughes, in a recent article in the *Review of Austrian Economics,*[1] seeks to apply the Austrian theory of the business cycle to the recession of 1990. In submitting his case, Hughes presents the Austrian business cycle theory and applies it to the evidence he has gathered. This comment focuses on the theoretical aspects of Hughes's paper.

Hughes commits two theoretical errors in his article. The first is that he associates the length of time of production with the entrepreneur's investment–planning horizon. The second is that he fails to understand that the amount of "lead time" an industry uses is not dependent upon where in the structure of production the firm is located.

Hughes, correctly, argues that higher-stage firms[2] (i.e., firms that are "further" from the final consumers in the production process) are inherently more sensitive to interest rates. He cites evidence that higher-stage firms had wider swings than lower-stage firms during the 1990 recession, and suggests Keynesian economists should stop "looking in the wrong place" and adopt the Austrian business cycle theory (p. 123). The wider swings among the higher-stage firms are predicted by the Austrian business cycle theory; however, it is the manner in which Hughes justifies this stylized fact that is faulty.

Hughes's reason why higher-staged firms have a greater sensitivity to the interest rate is based on two false assumptions. First, he states, "One big difference between the companies in different levels in the structure of production is the time that must elapse before their investments return a profit" (p. 109). Hughes implies that a higher-stage firm must wait until its good is ultimately transformed into a final consumer good before anyone can receive a return. Thus, the present value of a good in the process of production is dependent upon the length of time it takes a good to complete the production process (p. 110–11). The present value is derived from the

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[1]Arthur Middleton Hughes, "The Recession of 1990: An Austrian Explanation," *Review of Austrian Economics* 10, no. 1 (1997): 107–23.

[2]When referring to stages of production, the reference is made to the Hayekian triangle, which is a continuous input/point output model.

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discounted future value. Therefore, according to Hughes, a longer production time leads to a greater sensitivity in changes of the interest rate.

Hughes's erroneous construction of the structure of production stems from a confusion between the length of the time it takes a good to reach its final stage and the period of time it takes a firm to transform the good for the next stage (p. 109). The "stages" of the Hayekian triangle do not mark any particular length of time. It is not a measurement of how long the production process takes. It is merely stating that there is an order to the production process. This action comes first, followed by the next, and so forth. If we were to use Hughes's idea that the value of a good still in the production process is simply the discounted present value of the object, then the time axis of Hughes's figure 1 (p. 109) would have to be an objective length.

In Austrian theory, a single rate of interest is used as a simplifying assumption. This interest rate is the rate of return for all stages of the structure of production. Markets that have firms which make more than this rate attract competitors, while firms that earn less than this rate suffer losses and could be driven from the market.

The rate of return is represented by a uniform slope (creating the Hayekian triangle). Furthermore, the relative distances to consumer markets do not change this rate. Suppose a company in the middle of the structure of production changes its position by changing its customers so that it moves farther from the final stage of consumption. Would Hughes argue that the company's profits change simply because it changed customers and thus moved in the triangle?

The second assumption that compounds Hughes's error is his idea that "[a] higher-stage firm, such as a coal mine or primary metal producer, often has a much longer lead time."[3] In other words, Hughes is stating that a firm higher in the structure of production "often has" a longer period of investment (in terms of both initial and subsequent investment time). This is not true, and Hughes does not prove his conjecture. It does not follow that just because a firm is at a higher stage, that it needs more time to build its product nor is a longer time to equip a plant or train workers implied.

To illustrate his point that higher-stage firms are more sensitive to interest rates than lower-stage firms because of the amount of lead time stemming from location in the structure of production, Hughes presents the following example (pp. 110–11). Suppose there is a food retailer who is close to the consumers, and a primary metals manufacturer who is not. Hughes posits that the food retailer invests in delivery trucks that can be immediately used in the production process. The primary metals manufacturer also invests, but he decides to build a new plant that will cost "many hundreds of millions of dollars, and take ten years from site purchase to full production" (p. 110). Hughes, by equating the relative closeness of the firms to the consumers with the period of time it takes for an investment to become a part of the production process, claims that the higher stage firm is relatively more sensitive to the interest rate.

[3]By "lead time," Hughes means the time it takes an investment to be utilized in the structure of production (p. 109).

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However, Hughes should never have linked these elements together. There is no reason to think the primary metals manufacturer is forced to invest in projects with long durations, nor does Hughes provide empirical evidence to support the claim that they do. Suppose the primary metals manufacturer bought the trucks, and the food retailer invested in a project to open a chain of stores that would take millions of dollars and tens years to complete. This reversal does not change our economic actors' relative closeness to the consumers, but it does reverse the conclusion of their sensitivity to the interest rate. The firm's location on the structure of production is not the primary factor of a firm's sensitivity to the interest rate. Methodological individualism indicates that it is the entrepreneurs who determine how sensitive they are to interest-rate risk. The expected rate of return on the investment (factoring in risk, which includes an increased riskiness for longer undertakings) coupled with the project's degree of capital specificity determines the entrepreneur's sensitivity to the interest rate.

Hughes's observation that higher-order goods have wider swings in a cycle is valid. Austrian theory does suggest that interest rates play a role in these swings, but for reasons other than what Hughes suggests. Hughes posits that higher-stage firms are more sensitive to the interest rate because those firms are tied to the calculation of the present value of the final goods to be sold at a future date, or they are more sensitive due to lead time (pp. 109–11). Instead, as the interest rate changes, the ability to create a more roundabout method of production changes. When economic actors change their time preferences, so that they save more and consume less, they are signaling to entrepreneurs (through the fall in the interest rate) that they are more patient for present goods. Resources are transferred to higher stages of production. When economic actors change their preferences, showing that they are less patient (i.e., a decrease in the loanable funds supply curve), resources are transferred to the lower stages of production. When the economy shifts like this, relative prices and profit margins guide entrepreneurs to specific enterprises. Each firm's profits must meet the interest rate. If it is lower, then the firm is driven from that market; and if the firm is making economic profits, then others enter and compete them away. Thus, the interest rate is a guide to entrepreneurs, but is not used as Hughes theorizes.

The interest rate, in equilibrium, is the same as a firm's rate of return. The higher-staged firms are more sensitive to changes in this rate in the following manner. A consumer buys a finished good. The retailer must replenish his inventory and demands a replacement good from the wholesaler. The wholesaler then demands from the manufacturer, and so on. This process of imputing demand curves extends to the market where original factor resources are sold. The resource owner's reservation demand constitutes the supply curve for this market, and a price and quantity relationship emerges. This supply curve is imputed "forward" through the structure of production, thus allowing markets to form at every stage in the production process.

Each of these markets is affected by the rate of return (equal to the interest rate in a stationary state) through entrepreneurs' adjusting their supply and demand curves so that they can receive normal economic profits. In other words, a retailer will adjust his supply curve (in the consumer good market) and his demand curve (in the market that exists between the wholesaler and himself) so that he will be making a normal rate of return.

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When the rate of interest changes, it changes the rate of return that is necessary to obtain normal economic profits. Relative prices compound the effect of the change at every stage. Suppose that there is an increase in the supply of loanable funds. There will be two effects. First, as consumers dedicate more resources to their savings, retailers will face a decrease in the consumers' demand curves in their markets. As a result, retailers will decrease their demand of wholesaler goods in order that they may maintain a normal rate of profit. Second, the normal rate of profit will decrease (lower interest rates), thus cushioning the impact on the stage immediately higher in the structure of production (in this case the wholesalers) relative to the prior production stage (i.e., the retailers). The wholesaler will change his demand curve in the market between the manufacturer and himself according to the change in the retailers' demands (which is already dampened by the change in their rate of normal returns) *and* according to the change in the normal rate of profit as seen by the wholesaler. As the impact of the consumers' decrease in demand travels through the structure of production, the change in the rate of return is applied at each step. At some point in the structure of production, the compounding of effect of the change in the rate of return will dominate the change in demand. This is how the higher-order markets are able to expand while consumer market's demand curves are falling. There are two effects of this consequence. Larger swings in higher-order goods result, and it appears as though the prices of the goods are subject to the discounted present value formula. However, as explained above, while it may look as though this is the case, the change in relative prices stems from the factors illustrated above and not from the discounted present value formula.

Hughes also claims that the boom is brought to an end because the monetary authority, fearing a rapid increase in the price level, changes its policies by raising the discount rate or conducting contractionary open market operations (p. 113). While this may be true, the boom is always brought to an end due to shortages of real resources. The change in monetary policy only tends to hasten the realization of the malinvestments. As Hayek points out, there simply are not enough real resources to maintain the increase in both the new investment goods and consumers' goods.[4]

Austrian theory provides a powerful tool for the study of events such as the 1990 recession. I applaud Hughes's attempt to apply the Austrian business cycle theory to historical events. However, we must get the theory correct before the Keynesians will start looking in the places that we suggest.

[4]Friedrich A. Hayek, *Prices and Production*, 2nd rev. and enlarged ed. (New York: Augustus M. Kelly, [1935] 1967), pp. 85–100.

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THE AUSTRIAN THEORY OF VALUE AND CAPITAL: STUDIES IN THE LIFE AND WORK OF EUGEN VON BÖHM-BAWERK. KLAUS H. HENNINGS, ED. BROOKFIELD, VT.: EDWARD ELGAR, 1997

Modern economics is notorious for its inattention to capital in the sense of an intertemporal structure of intermediate goods. Production takes time, and the time that separates the formulation of multiperiod production plans and the satisfaction of consumer demands is bridged by capital. If mentioned at all, these aspects of economic reality are introduced as "the thorny issues of capital," a tell-tale phrase that portends a dismissive treatment of this critical subject area. Though a lacuna in mainstream economics, capital theory has long been a keystone in Austrian economics. With a full awareness of all the thorns, Eugen von Böhm-Bawerk (1851–1914) built his academic career around the goals of understanding the relationship between capital and interest, and extending value theory to the context of intertemporal allocation.

Klaus Hinrich Hennings (1937–1986) studied the life and work of Böhm-Bawerk in the early 1970s under the guidance of John R. Hicks. His Ph.D. thesis was ripe for publication, but Hennings's nonacademic endeavors deferred the realization of his plan. Before his untimely death, he excerpted and condensed portions of his manuscript for the Milgate et al., eds., *New Palgrave Dictionary of Economics* (1987). The entry on Böhm-Bawerk together with related entries (on capital as a factor of production, maintaining capital intact, roundabout methods of production, and waiting) provide a good summary of his thesis. Now, a quarter century after its writing and more than a decade after its author's death, Hennings's *Studies*, along with a preface by Heinz D. Kurz of the University of Graz, Austria, and twenty years of Böhm-Bawerk's correspondence with Swedish economist Knut Wicksell (forty letters), has jelled into a book.

Most illuminating is Hennings's chapter on "The Genesis of a Theory." Here we learn that Böhm-Bawerk had taken up a central question that was much discussed by his contemporaries and predecessors. "Is there any justification for the payment of interest to the owners of capital?" Hennings's earlier chapter on the continental tradition of classical economic thought puts both the question and the possible answers into sharp historical perspective. Böhm-Bawerk's "agio theory" and its implications for the alternative "exploitation theory" were enough to win him recognition by historians of economic thought. But, as Hennings persuasively argues, Böhm-Bawerk's theory broke new ground and was much more than the refutation of socialist doctrine.

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> Böhm-Bawerk's analysis culminates in a macroeconomic model of general equilibrium which is used to discuss not only the neoclassical problem of the existence and the determination of the rate of interest, but also the more classical problem of the effects of the accumulation of capital and the rate of technical progress. (p. 2)

Making use of the foundational value theory set out by Menger and taking an economy-wide perspective, Böhm-Bawerk linked the intertemporal preference structure of consumers with the intertemporal structure of production. His theory was a "full-fledged theory of intertemporal behavior in a market economy" (p. 65).

We have it, then, that Böhm-Bawerk was a macroeconomist—and a self-reflective one at that. The word "macroeconomics," of course, is a relatively modern one.[1] But in 1890, Böhm-Bawerk wrote in the *Annals of the American Academy of Political and Social Science* that "One cannot eschew studying the microcosm if one wants to understand properly the macrocosm of a developed economy" (p. 74). Packed into this understated methodological maxim is both his desire to understand the macroeconomy and his recognition that microeconomic foundations are essential for a viable macroeconomics—a view that, in the mainstream, dates only to the mid-1960s.[2]

Hennings is profoundly respectful of Böhm-Bawerk's work. He sees much good in it, and much scope for the development in the general direction staked out by Böhm-Bawerk's *Positive Theory*. But recognizing that his much-criticized and badly misunderstood period of production was a focal point of his analysis, Hennings (p. 129) opines that "Böhm's discussion is indeed often more confusing than enlightening, his use of terms inconsistent, and his examples badly chosen; worse still, a crucial step in his argument can be shown to be false." The falsity lies in the construction of an average period of production (p. 134ff) and in the assumption of a fixed subsistence fund (p. 140ff). The problems stem from the now well-established fact that neither the average period nor the size of the subsistence fund can be calculated in purely physical units. Both are dependent on input prices and hence on the interest rate. But allowing for endogenous and interest-rate-dependent measures introduces ambiguities that invalidate the simple conclusions drawn by Böhm-Bawerk. Though critical, Hennings

[1] It should be noted that the classical economists, especially Ricardo, could be considered macroeconomists in an era that predates any hint of the modern distinction. Most economists would suspect that the word itself first emerged from the pen of Paul Samuelson, but Samuelson denies it. He points a finger at Ragnar Frisch and Jan Tinbergen and dates the word's debut in print to Erik Lindahl in 1939. Paul A. Samuelson, "Credo of a Lucky Textbook Author," *Journal of Economic Perspectives* 11, no. 2 (Spring 1997): 157. It was Samuelson, however, who reorganized the subject matter of economics on the basis of a first-order distinction between microeconomics and macroeconomics.

[2] Hennings's frequent and explicit references to Böhm-Bawerk as a macroeconomist make for an intriguing comparison between this treatment of the Austrian theory of capital and interest and Israel Kirzner's *Essays on Capital and Interest* (Cheltenham, U.K.: Edward Elgar, 1997), which appeared almost simultaneously with Hennings's book. Kirzner eschews Austrian business cycle theory—and with it, presumably, the whole of macroeconomics—on the grounds that developments in this direction have not been adequately anchored to the subjectivism that has become so characteristic of modern Austrian economics. Rather than being seen as methodologically antithetical, however, these two volumes are more usefully seen as companion micro and macro perspectives on capital and interest.

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differs from modern detractors of Austrian capital theory by his believing—with good reason—that the flaws are far from fatal. He does not see them as discrediting Böhm-Bawerk's general approach to the theory of production (p. 170); he calls not for a rejection of the theory but for amendments to it (p. 182).

Hennings (p. 131) reproduces Böhm-Bawerk's bull's-eye figure—a pattern of concentric rings intended to depict the time-structure of production. Production begins in the center with the use of the original means (land and labor); the process emanates outward over time; and the final product emerges at the outermost ring to satisfy the consumers' ultimate ends. Hennings ignores all subsequent developments along graphical lines (including Robert Dorfman's 1959 classic rendition of Austrian theory[3]). This idiosyncratic depiction can be seen as a forerunner of the more straightforward representation of the means-ends framework introduced by F.A. Hayek during the interwar period. The Hayekian triangle captures the essential linearity—not to deny that there are some non-linearities—in the structure of production. The triangle, which is divided along the time axis into "stages of production," corresponds closely with the bull's eye figure, which is divided along the radius into "maturity classes."

Though static by its very construction, the bull's-eye figure, as well as the better known Hayekian triangle, is intended to facilitate the analysis of change. What is the nature of the market forces that govern the allocation of resources among the various rings? Here, where Hennings is strongly influenced by Hicks's treatment of the "traverse" (the sequence of inputs and outputs that characterize the transition from one static state to another), Böhm-Bawerk's formal statement of his theory—and Hennings's even more formal statement—come in for the severest criticism. Hennings (p. 150) writes that

> Because [Böhm-Bawerk's approach] is macroeconomic in nature, it depends essentially on the way in which production is organized in different units. It breaks down when the way in which production is organized changes. As any dynamic process of change must necessarily alter the organization of production, Böhm's approach is ill-suited for a dynamic analysis of the production process of an economy. Precisely because it does not pay enough attention to entrepreneurial decisionmaking on a microeconomic level, it cannot study the process in which entrepreneurs, interacting with each other, change their production process such that the macroeconomic result is a change from one technique to another.

Yet, Böhm-Bawerk's informal analysis of the nature of the process of change, an analysis for which his approach was well suited, is not discussed by Hennings. In the case of the stationary state, the concentric rings have two interpretations: (1) the production process can be seen as proceeding over time from earliest input to final output, and (2) the areas of the rings can represent the amounts of the different kinds of capital (goods in process) that exist at a given point in time. As already suggested, depicting the stationary state was only a prelude for Böhm-Bawerk. He briefly

[3]Robert Dorfman, "A Graphical Exposition of Böhm-Bawerk's Interest Theory," *Review of Economic Studies* 26 (February 1959): 153–58. Dorfman's exposition reinforces the notion that Böhm-Bawerk was a macroeconomist.

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considered the question: "What is the procedure if we wish just to preserve the amount of capital in its previous magnitude?" His answer, given in short order, is followed by the more important question: "What must be done if there is to be an increase in capital?" The answer to this question involves a change in the configuration of the concentric rings. Several types of changes are suggested, each entailing the idea that real saving is achieved at the expense of consumption and of capital in the outer rings and that the saving makes possible the expansion of capital in the inner rings. Böhm-Bawerk indicates that in a market economy it is the entrepreneurs who bring such structural changes about and that their efforts are guided by changes in the relative prices of capital goods in the various rings. Formal or informal, the message is clear: An increase in capital is not to be viewed as a simultaneous and equiproportional increase in capital in each of the maturity classes; it is to be viewed as a reallocation of capital among the maturity classes.[4]

It is easy for the modern Austrian economist to see that Böhm-Bawerk was just a step away from articulating the Austrian theory of the business cycle. This step, which was actually taken by Mises and Hayek, involved a comparison of changes in the configuration of the rings on the basis of whether those changes were preference-induced or money-induced. A change in intertemporal preferences in the direction of increased saving reallocates capital among the rings such that the economy experiences capital accumulation and sustainable growth; a money-induced change in credit conditions misallocates capital among the rings such that the economy experiences unsustainable growth and economic crisis.

Development of the theory in this direction was beyond Böhm-Bawerk for the simple reason that he would not allow himself to venture into monetary theory. His attitude toward this subject matter is revealed in the letters to Wicksell. In 1907, he wrote: "I have not myself given thought to or worked on the problem of money as a scholar, and therefore I am insecure *vis-à-vis* this subject." In 1912: "You know that I do not really feel competent as regards the extremely difficult theory of money." Also in 1912, referring to *The Theory of Money and Credit*, in which Mises first articulates the Austrian theory of the business cycle, Böhm-Bawerk mentions to Wicksell "a book on the theory of money by a young Viennese scholar, Dr. von Mises. Mises is a student of myself and Prof. Wieser, which, however, does not mean that I would want to take responsibility for all his views. I have just begun to read his book myself, and am not yet familiar with its content." And finally in 1913, a year before his death, "I have not yet included the theory of money in the subject-matter of my thinking, and I therefore hesitate to pass a judgment on the difficult questions it raises. . . . [A] judgment not based on serious study, that is to say, a dilettante's judgment, I do not want to put forward."

These instances of self-assessment and others contained in the letters to Wicksell give us some insight into Böhm-Bawerk's character. Hennings's early chapter on his

[4]Eugen von Böhm-Bawerk, *Capital and Interest*, George D. Huncke and Hans F. Sennholz, trans. (South Holland, Ill.: Libertarian Press, 1959), vol. 2, pp. 102–18. Bull's-eye figures for well-developed and less-well-developed economies appear on pp. 106 and 107; quoted questions are from p. 109.

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life and times provides us with a feel for how he juggled his two careers—as public official and as academician. Still, the reader will feel that little has been uncovered about his private life—except that he was a very private person.[5] We do learn that Böhm-Bawerk was a "keen mountaineer" and a "gifted cellist," but the letters to Wicksell are more revealing. Although an Austrian gentleman who exhibited "immense politeness," Böhm-Bawerk did not pull any punches when evaluating his contemporaries. Of Otto Conrad, a Viennese secretary at the chamber of commerce, Böhm-Bawerk wrote in a letter of 1913 that "He is a kind of autodidact, who has not gone through a competent school, and despite some abilities which he possesses, he has remained half a dilettante. Confused and unclear." Of Robert Liefmann, a professor at a German University, Böhm-Bawerk wrote (in the same letter) that he "is, however, worse. . . . One of the most unpleasant mixtures of boundless arrogance, total confusion, and complete lack of conscientious care." Even the young Schumpeter fell victim to Böhm-Bawerk's acid pen in another letter of 1913: "It will be agreeable to read again a serious, meticulous, and carefully considered theoretical work [Wicksell's *Lectures*]; so different from the clever but insubstantial fantasies of Schumpeter or even the products of Liefmann." (One has to wonder what such a private person as Böhm-Bawerk would think about the publication of these letters.)

As substantial an economist as Schumpeter could claim that interest is a disequilibrium phenomenon and fantasize about a long-run equilibrium where market forces have pushed the interest rate to zero. John Maynard Keynes imagined interest to be a purely monetary phenomenon. Creating what Hayek called a "mythology of capital," Frank Knight held that production and consumption occur simultaneously, that the period of production is irrelevant, and that the interest rate is wholly determined by technological considerations. F.A. Hayek found it necessary to repeat with Knight the debate that had earlier taken place between Böhm-Bawerk and John B. Clark. These and other twists and turns in twentieth-century views of capital and interest give increased significance to the early wisdom of Böhm-Bawerk—and give timeless value to the critical assessment of the Austrian theory offered by Klaus Hennings.

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[5]Even the most cursory textbook treatments of the Austrian economists manage to report the fact that Böhm-Bawerk and Wieser were brothers-in-law. But who married whose sister? From Hennings, we learn that Böhm-Bawerk married Wieser's younger sister Paula in 1890, and that she survived her husband by fourteen years.

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ERRATUM

The Quarterly Journal of Austrian Economics 1, no. 1 (Spring 1998): 38, footnote 16, should have read, in part: "in terms of the equation of exchange, we can say that free banking adjusts M so as to offset changes in V: but allows changes in Q to be accommodated by changes in P."

The editors regret this error.

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